Staff Findings
and Recommendations

Alignment of Postsecondary Education and Employment

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Legislative Program Review
& Investigations Committee

CONNECTICUT GENERAL ASSEMBLY

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Introduction

STUDY OVERVIEW

Numerous reports have identified an increasing gap in how well Connecticut prepares its workforce for the demands of current and near-future employment. The Legislative Program Review and Investigations Committee voted to conduct a study examining *Alignment of Postsecondary Education and Employment* in April 2009. The focus of the first phase of the study was to determine whether a formal alignment mechanism exists in Connecticut to match the production of skilled graduates from the state's higher education institutions (including public and independent universities, four-year colleges, and community colleges) with the current and projected workforce needs of the state's employers. The study also assessed current workforce supply and employer needs, and reviewed whether pathways exist for technical high school graduates to pursue postsecondary education certificates and degrees.

The briefing report found an overall lack of alignment of postsecondary education and employment for a majority of the occupations examined. (Excluded from this alignment analysis were the many broad college majors that lead to employment in a multitude of occupations.) While some occupations appeared to be particularly well aligned, such as registered nurses, the majority of occupations examined seemed to have an oversupply or undersupply of workers.

The briefing report identified a number of barriers contributing to the misalignment of postsecondary education and employment. An increasing number of new college students are unprepared for college-level work and are enrolled in remedial or developmental courses. This lack of preparedness can be traced back to elementary and secondary schools, where an increasing number of students as young as fourth graders do not score as well in science, math, and reading compared to students in other New England states. Additionally, the briefing report highlighted the difficulties in making accurate projections of demand for particular occupations ten years into the future. Connecticut's system for public higher education was found to be very decentralized, with multiple boards of trustees, and funding allocated directly to the constituent units based largely on enrollment size rather than on results.

Because of the broad nature of the study, the committee decided to examine two areas in depth to see if there were successful state strategies that better align postsecondary education with the needs of Connecticut's employers and that could be applied to other occupational shortage areas. The two areas selected for intensive review were the emerging field of green collar job, and the nursing field because the state had already implemented a number of strategies to increase the number of nursing graduates.

This report recommends potential solutions to overcoming barriers to alignment, drawing on lessons learned from the detailed examination of the strategies used to successfully align postsecondary education and employment in the nursing profession as well as information learned in studying the emerging green collar jobs field.

Green Collar Jobs

Green collar occupations are a less established, emerging field. The following questions were used to review the green collar field:

1. What is *driving* the green movement?
2. How are green collar jobs being *defined*?
3. Who is *developing* the green collar field and where will the job opportunities be?
4. What green collar job education and training is being *delivered*?

Forces driving the green movement within Connecticut include: the American Recovery and Reinvestment Act of 2009; Governor Rell's Executive Order No. 23, which established the Connecticut Energy Sector Partnership and a blueprint for green collar jobs creation; recent Connecticut statutory changes promoting green building code requirements, and implementing green strategies through the Connecticut Clean Energy Fund and the Connecticut Energy Efficiency Fund; and the private sector, establishing and expanding companies and initiatives in the energy sectors.

There are a multitude of green collar job definitions produced by such entities as the U.S. Department of Labor, the Connecticut Department of Labor, Department of Economic and Community Development, and green job study groups and institutes. Definitions of green collar jobs vary widely, depending on who is defining the field, and whether they are focusing on new and emerging occupations such as carbon trading analysts and wind energy engineers, occupations that currently exist and require additional green skills and knowledge, or current occupations that will be in greater demand as they are performed within a green setting.

Green collar job opportunities are developing in Connecticut in a range of occupations, from hydrologists, environmental engineers and natural sciences managers, to builders and sellers of energy related products, energy efficient building construction, and building operations and maintenance. Solar and wind power, and fuel cells are other areas anticipated to offer green collar job opportunities.

Lastly, green collar education and training is being delivered in postsecondary education in the following five ways:

1. offering majors or minors in directly related fields such as environmental science or environmental engineering;
2. offering majors or minors associated with the green movement;
3. establishing centers or institutes directly related to renewable energy, energy efficiency, or other green related areas;
4. certificates in green collar fields; and
5. individual courses to add green collar skills and/or knowledge.

Nursing Field

The nursing field was chosen for examination because that occupational group had experienced a significant shortage a decade ago and successfully increased supply to address demand. Findings on the strategies used for this successful alignment are described with the possibility that the strategies can be applied to other fields experiencing workforce shortages.

The two sources of information regarding employer need for register nurses showed need for registered nurses. In 2006, Connecticut's labor department projected a need for 1,130 new registered nurses each year through 2016. The Connecticut Hospital Association reported a vacancy rate of 11.6 percent in 2001, although this had declined to 6.6 percent in 2007, and 3.6 percent in 2009 –nearly half of what it had been one year before the economic downturn began.

Various efforts and factors have resulted in better alignment of the nurse supply and demand. Program review committee staff examined ten years of data on students enrolled in Connecticut's nursing programs and found at the lowest point in the 2000-2001 academic year there were 594 graduates of associate or baccalaureate programs leading to eligibility for RN licensure and by 2007-2008 academic year there were 1,118 graduates, an increase of 88 percent. The economic recession may have also contributed to improved alignment. Previous studies indicate that nursing shortages are cyclical and during times of high unemployment, more nurses work in direct patient care, move from part- to full-time employment, or re-enter the workforce.

Multiple strategies were adopted in Connecticut in reaction to the impending nursing crisis and the response included both public and private entities. These included: the aggressive pursuit of federal, state, and private funding to provide tuition assistance; student advising and targeted student tutoring; beginning new nursing programs or expanding existing ones; and collaboratively partnering between nursing programs and hospitals and other health care institutions in the state.

A key action taken by the legislature to address the nursing shortage was the creation of the Allied Health Workforce Policy Board under P.A. 04-220. The board is charged with conducting research and planning activities related to the allied health workforce. This provided a formal mechanism for information to be exchanged and shared among parties working toward common goals.

Based on the success of the Allied Health Workforce Policy Board, PRI staff found the board structure could be used as a model for other targeted shortage areas. The advantages of this model include:

- making decisions collaboratively;
- acting as a clearinghouse for individual pilot or creative projects being implemented by colleges, universities, or other organizations;
- allowing for creativity at the local/regional level, with ideas shared and dispersed; and
- having the ability to propose legislative and non-legislative solutions as one voice.

Recommendations to Address Barriers to Alignment of Postsecondary Education and Employment

The briefing report identified a number of barriers contributing to the misalignment of postsecondary education and employment that related to: elementary and secondary school students in the knowledge/talent pipeline; postsecondary education institutions; workforce demand projections; and state agency organization, programs and policies. PRI staff recommends potential solutions to overcoming the barriers, drawing on lessons learned from a detailed examination of the strategies used to successfully align postsecondary education and employment in the nursing profession as well as information learned in studying the emerging green collar jobs field.

Research methods. Program review committee staff conducted interviews with staff from: the State Department of Education (SDE); the Departments of Higher Education (DHE), Labor (DOL), Economic and Community Development (DECD), and Consumer Protection; and the Office of Workforce Competitiveness (OWC). Interviews were also held with college administrators and faculty at the University of Connecticut, the Connecticut State University System, and the Connecticut Community College System. On-site visits were made to: Central, Eastern, and Southern Connecticut State Universities; and Asnuntuck and Manchester Community Colleges, including a visit to the middle college, Great Path Academy, located at Manchester Community College. As part of the in-depth examination of nursing, information was collected from the University of Connecticut, the three universities in the Connecticut State University System with nursing programs, the Connecticut Community College System, the Connecticut Hospital Association, the Board of Examiners for Nursing, the Connecticut League for Nurses, and the Allied Health Workforce Policy Board. The in-depth examination of green collar jobs included interviews with representatives from the Connecticut Clean Energy Fund, Gateway Community College's Center for a Sustainable Future, Office of Workforce Development at the Interstate Renewable Energy Council (IREC), the Unit Coordinator for Trade Technologies for Connecticut Technical High Schools, and California Community Colleges' Centers of Excellence for Economic and Workforce Development.

Information on relevant majors, programs offered, student enrollment, graduation rates, and passing rates on licensure exams were analyzed. Information relevant to the alignment of postsecondary education and employment was also gathered via a survey that was completed by 14 members of the Connecticut Conference of Independent Colleges. Questions encompassed a broad range of areas including remedial coursework, new additions and discontinuations of programs, placement rates post-graduation for nurses and engineers, and ways the Connecticut Department of Labor workforce shortage projections are used.

Best practices found in the literature were also reviewed and incorporated into recommendations to address various barriers, especially those pertaining to challenges regarding lack of preparedness of high school graduates for postsecondary education, delivery of remedial coursework, and retention of college students.

Report organization. Section I presents an in-depth examination of green collar jobs including information about: what is driving the green movement; how green collar jobs are defined;

who is developing the green collar field and where the job opportunities will be; and what green collar job education and training is being delivered. Section II describes the results of an in-depth examination of the nursing field and identifies successful strategies that were used to increase the number of students entering nursing programs, which could also be used for other occupational shortage areas. The last section, Section III, recommendations potential solutions to overcoming barriers to the overall alignment of postsecondary education and employment, drawing on lessons learned from the detailed examination of the strategies used to successfully align postsecondary education and employment in the nursing profession as well as information learned in studying the emerging green collar jobs field.

Section I

GREEN COLLAR JOBS

This section describes the emerging field of green collar jobs and how education is aligning with the needs of the new field. The information is organized into answering the four "D's" of the green collar field:

- What is **driving** the green movement?
- How are green collar jobs **defined**?
- Who is **developing** the green collar field and where will the job opportunities be?
- What green collar job education and training is being **delivered**?

Figure I-1 provides a roadmap for this section's information on the four D's of the green collar field. The green movement in Connecticut is being driven by a confluence of forces including an array of grants stemming from the American Recovery and Reinvestment Act of 2009, Governor Rell's Executive order establishing a blueprint for green collar jobs creation, a host of green-related statutory changes, and the private sector. This section will also describe the multitude of green collar job definitions and inherent challenges in defining an emerging field. The efforts of the many agencies, organizations, and companies working to develop the green collar field are described, and projections of where future job opportunities will be are given. The section concludes with an overview of the roles of the public postsecondary institutions, independent colleges and proprietary schools, and technical high schools in delivering education and training to prepare individuals for green collar jobs.

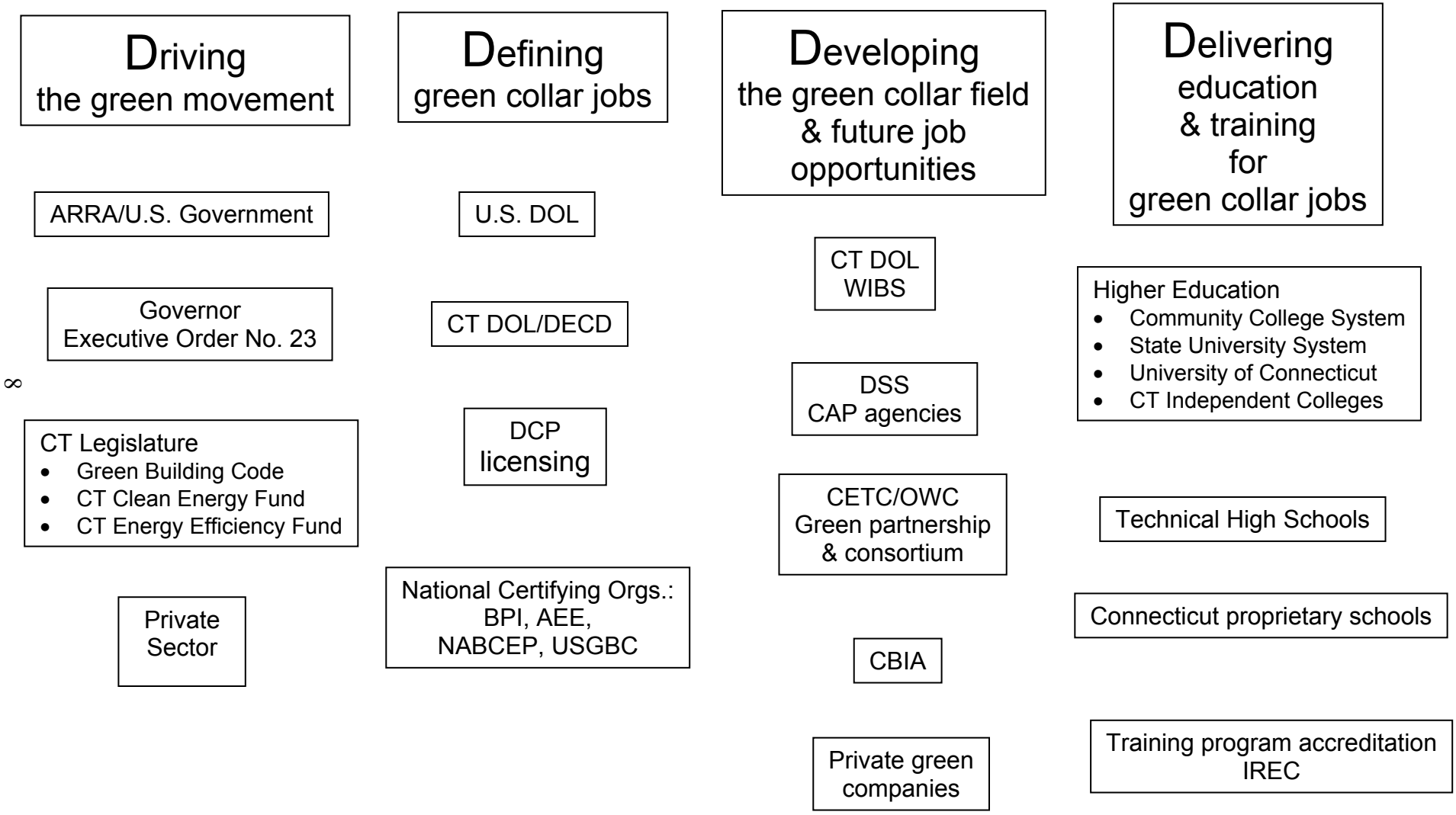
What is Driving the Green Movement?

The first "D" is understanding what is *driving* the green movement. One of the driving forces of the green movement within Connecticut and nationally, is the *American Recovery and Reinvestment Act of 2009 (or ARRA).* Federal stimulus funding from ARRA is expected to deliver an influx of at least $50 billion nationally to the energy efficiency and renewable energy sectors and create 500,000 green jobs by the end of 2010.[1] Another driving force is *Governor Rell's Executive Order No. 23,* which established a blueprint for green collar jobs creation. The executive order calls for a number of efforts including the establishment of a Green Collar Jobs Council – subsequently renamed the Connecticut Energy Sector Partnership -- and an Energy Workforce Development Consortium, to advise the partnership on current and future workforce needs of energy-related companies in the state.

Yet anther driving force of the green movement within the state are *recent Connecticut statutory changes* promoting green building code requirements, and implementing green strategies through the Connecticut Clean Energy Fund and the Connecticut Energy Efficiency Fund. The *private sector* also plays a role in driving the green movement, establishing and expanding

[1] Preparing the Workforce for a "Green Jobs" Economy, research brief from the John J. Heldrich Center for Workforce Development, February 2009.

Figure I-1. The Four D's of the Green Collar Field



Source: PRI staff analysis.

companies and initiatives in the energy sectors, and leading the way internationally in the commercial fuel cell industry.

American Recovery and Reinvestment Act of 2009 is driving the green movement. The American Recovery and Reinvestment Act of 2009 (ARRA) is a national effort to create or save jobs, jump start growth and transform the economy for the 21st century. Federal stimulus funding from ARRA is expected to generate many green collar jobs. To date, Connecticut has been awarded $120,767,152 in stimulus funds for green efforts; four other grant applications totaling $13,637,680 are pending. Because they are such a significant driver of the green movement, each of the ARRA grants pertaining to green collar jobs is now briefly described.

ARRA Green Grants Awarded. The recent federal stimulus funding will directly impact the available green workforce supply in Connecticut. Table I-1 shows a sample of jobs to be created from the federal American Recovery and Reinvestment Plan as projected by the University of Massachusetts-Amherst Department of Economics and Political Economy Research Institute.

Table I-1. Projected Green Collar Investments and Jobs

Strategy	Sample Jobs
Building Retrofitting	Electricians, Heating/Air Conditioning Installers, Carpenters, Construction Equipment Operators, Roofers, Insulation Workers, Carpenter Helpers, Industrial Truck Drivers, Construction Managers, Building Inspectors
Mass Transit/Freight Rail	Civil Engineers, Rail Track Layers, Electricians, Welders, Metal Fabricators, Engine Assemblers, Bus Drivers, Dispatchers, Locomotive Engineers, Railroad Conductors
Smart Grid	Computer Software Engineers, Electrical Engineers, Electrical Equipment Assemblers, Electrical Equipment Technicians, Machinists, Team Assemblers, Construction Laborers, Operating Engineers, Electrical Power Line Installers and Repairers
Wind Power	Environmental Engineers, Iron and Steel Workers, Millwrights, Sheet Metal Workers, Machinists, Electrical Equipment Assemblers, Construction Equipment Operators, Industrial Truck Drivers, Industrial Production Managers, First-Line Production Supervisors
Solar Power	Electrical Engineers, Electricians, Industrial Machinery Mechanics, Welders, Metal Fabricators, Electrical Equipment Assemblers, Construction Equipment Operators, Installation Helpers, Laborers, Construction Managers
Advanced Biofuels	Chemical Engineers, Chemists, Chemical Equipment Operators, Chemical Technicians, Mixing and Blending Machine Operators, Agriculture Workers, Industrial Truck Drivers, Farm Product Purchasers, Agricultural and Forestry Supervisors, Agricultural Inspectors

Source: University of Massachusetts-Amherst Department of Economics and Political Economy Research Institute (PERI), "Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy," September 8, 2008.

Table I-2 shows the anticipated green skills training for new and current workforce members expected as a direct result of ARRA green grants awarded. Training ranges from explaining the new green building code to current building officials, to the creation/expansion of certificates in such areas as solar energy technologies and precision manufacturing.

Table I-2. ARRA Green Grants Awarded to Connecticut

Grant	Direct Impact on Green Collar Jobs/Training
State Energy Program (SEP) • $38,542,000 • U.S. Dept. of Energy • Approved: 4/1/09-3/31/12 • Applicant: OPM	• Supports energy efficiency/renewable energy programs/initiatives • Will include training of building operators and building officials in new green building code • Also includes building code update incorporating new Connecticut requirements for residential buildings and commercial buildings
DSS Weatherization Assistance Program • $64,310,502 • U.S. Dept. of Energy • Approved: 4/1/09-3/31/12 • Applicant: DSS	Authorizes OWC and Connecticut Community College System (CCCS) to assist DSS in the provision of weatherization training services with the involvement of the Regional Workforce Investment Boards and Jobs Funnel programs. Training and Technical Assistance will include: • Statewide lead safe training on new DOE minimum standards • Energy auditor certification training (one to two-day courses) • Also short-term on-the-job training for crews, energy auditors, and subcontractors • Two-week core competency training includes safe work practices, building evaluation, and measurement
Energy Efficiency & Conservation Block Grant • $9,593,500 • U.S. Dept. of Energy • Approved: 8/1/09-7/31/12 • Applicant: OPM/Energy Management Unit	• Used to provide sub-grants to 143 local Connecticut governments not otherwise eligible for direct formula grants • Minimum of $25,000 per municipality, increased depending on population • Funding must be used in a manner that is consistent with the state's energy policy framework (C.G.S. Sec. 16a-35k), P.A. 08-98, and Governor Rell's Connecticut's Energy Vision Plan
SOAR (Sustainable Operations: Alternative and Renewable Energy Initiative) • $2,000,000 • U.S. Dept. of Labor • Approved: 2/15/09-2/14/12 • Applicant: Connecticut Community College System	Creates eight certificate programs (for credit) at the state's community colleges: 1. Sustainable Facilities Management 2. Sustainable Landscape Ecology & Conservation Technician 3. Building Efficiency & Sustainable Technologies Certificate/Sustainable Facilities Management 4. Alternative Energy Transportation 5. Clean Water Treatment 6. Solar Energy Technologies 7. Alternative Energy Systems 8. Sustainable Energy Certificate 320 students will earn a CCCS Sustainable Operations Certificate in one of these eight areas and: • 85% of SOAR students will enter employment • Regional Coordinators will work with 900 clients/students, train 350 One-Stop and high school counselors • 20 college instructors will receive professional development

	training, and will train 800 students annually

Table I-2 Continued. ARRA Green Grants Awarded to Connecticut

Grant	Direct Impact on Green Collar Jobs/Training
SMART (Skills for Manufacturing and Related Technologies) Initiative • $2,191,400 • U.S. Department of Labor • Approved: 4/1/08-3/30/11 • Applicant: Connecticut Community College System	Creates/expands three community college certificate programs, with target of 331 students achieving credentials: • Pre-Manufacturing Certificate program • Level One Precision Manufacturing Certificate program • Level Two Precision Manufacturing Certificate program (offering specialties in precision machining and computer numerical control technologies, welding technology, and electronics control technology, and featuring a paid internship)
"Making 'Green' Real" Grant • $3,999,923 ($250,000 for CT) • U.S Department of Labor • Approved: 12/1/09-5/31/11 • Applicant: Vermont Department of Labor (on behalf of Northeast Research Consortium)	• Includes 6 New England states plus New York and New Jersey; Vermont will lead the consortium • Purpose: create a regional infrastructure to allow businesses and workers who employ, train or work in energy efficiency and renewable energy fields, to have access to reliable information • Consortium's work to be conducted in four phases: o Creating clear definitions and coding tools o Demand analysis estimates including 6-12 month vacancy projections o Use and extension of current labor market information tools, data collections and databases o Creation of electronic and other dissemination tools including green job banks
Green Capacity Building Grant YouthBuild Bridgeport • $59,894 • U.S. Department of Labor • Approved: 12/1/09-11/30/10 • Applicant: The Workplace, Inc., Bridgeport	• Intended to build the green training capacity of current DOL grantees • Goal: train 20 students (17-24 years old) currently enrolled in project prepare for careers in emerging energy-efficient green building construction and retrofit industries • Successful completion of the program will qualify graduates for Carpenters Union, Local 210 apprenticeship programs • Will also train five local instructors by trainers from the Home Builders Institute
Green Capacity Building Grant YouthBuild Hartford • $69,933 • U.S. Department of Labor • Approved: 12/1/09-11/30/10 • Applicant: Co-Opportunity, Inc., Hartford	• Intended to build the green training capacity of current DOL grantees • Goal to train 20 students (17-24 years old) currently enrolled in the YouthBuild project prepare for careers in deconstruction (dismantling buildings with goal of preserving reusable materials and reducing landfill needs) • Also certify 2-3 YouthBuild instructors as trainers for deconstruction, and provide internships to 3 YouthBuild students

Source: PRI staff analysis of federal green grant applications.

Pending ARRA Green Grants. There are also several ARRA grant applications pending notification that would also have a direct impact on green collar jobs/training should they be awarded to Connecticut. Table I-3 shows the pending ARRA green grants for Connecticut, featuring aspects of the grants that, if awarded, would impact green collar jobs/training.

Activities would range from training building analysts and clean water technicians, to increasing members of the green construction trade. A more complete description of awarded and pending ARRA grants to Connecticut is found in Appendix A.

Table I-3. Pending ARRA Green Grants for Connecticut

Pending Grant Application	Direct Impact on Green Collar Jobs/Training if Awarded
CT Green Jobs Partnership (SESP) • $3,360,000 • U.S. DOL • Approx. 1/1/10-12/31/12 • Applicant: CETC	• Building Analyst Training at the CT Community Colleges, (100 candidates over three years) • Green Manufacturing –Lean/Green (30 to get certificates) • Clean Water Technicians (65 certified at Wastewater Technician Level III), by Goodwin and Gateway Community College • Municipal Building Officials Training in RE/EE Inspection for 180 o via Institute for Sustainable Energy at ECSU—half-day workshops for building code officials

***Energize CT!* A Statewide Energy Training Partnership**
• $2,210,800
• U.S. Department of Labor
• Approx. 1/1/10-12/31/12
• Applicant: CT Energy Workforce Development Consortium
	• Train 766 workers in three growing occupations:
	  o Solar PV/solar thermal/geothermal installers
	  o Diesel engine mechanics
	  o Energy efficiency building managers

Pathways Out of Poverty
• $3,066,880
• U.S. Dept. of Labor
• Approx. 1/1/10-12/31/12
• Applicant: Capital Workforce Partners WIB
	Place 350 Hartford residents in jobs in the green construction and sustainable energy generation industries
	• CCSU's Institute for Technology and Business Development to give orientation to emerging green economy, and introduction to sustainable energy generation
	• Other postsecondary institutions will provide green-focused certificate and degree programs that participants will access via individual training accounts
	• Three labor partners to provide green construction training and assist with subsequent placements:
	  o New England Laborers' Training Academy
	  o Ironworkers Local #15 Apprenticeship Program
	  o Finishing Trades Institute of Southern New England

"Green-up Bridgeport" Pathways Out of Poverty • $5,000,000 • U.S. Department of Labor • Approx. 1/1/10-12/31/12 • Applicant: The Workplace, Inc., Southwestern CT's WIB (Bridgeport)	• Focus on entry level green skills in established occupations that are projected to have increased demand • Education and training offered by ECSU, CCSU, Gateway CC, Housatonic CC, Norwalk CC, and U. of Bridgeport • Serve 600 participants in beginning education and training activities

Source: PRI staff analysis of federal green grant applications.

Executive Order No. 23 is driving the green movement. The executive order regarding green collar jobs, which was issued on February 2, 2009, specifies the need to design initiatives and programs to spur the growth of green collar jobs in Connecticut and directs such planning to begin in four ways.

First, the commissioners of DECD and DOL are to plan for the development and growth of green industries and green jobs, in coordination with the executive director of the Office of Workforce Competitiveness (OWC), the commissioners of SDE, DHE, and DEP, and the chancellor of the community college system. Developed June 2009, the plan was presented to the Connecticut Employment and Training Commission.

Second, CETC was to create and chair the Green Collar Jobs Council, which is composed of representatives from: the Departments of Education, Higher Education, Environmental Protection, Labor, and Economic and Community Development; the newly created Energy Workforce Development Consortium; and representatives from business and industry.[2] The council name was subsequently changed to the Connecticut Energy Sector Partnership in order to better position the state for federal funding (ARRA) opportunities.

The Connecticut Energy Sector Partnership structure (Figure I-2), which was distributed at the first meeting of the partnership (August 20, 2009), recognizes the need for collaboration by the many state agencies and organizations involved in the initiative. The purpose of the partnership is to develop green collar job opportunities, public-private partnerships, and job training programs.

The partnership is charged with developing and implementing a state energy sector strategic plan as required by the U.S. DOL in its solicitation of grant applications for State Energy Sector Partnership and Training Grants. As described under the pending ARRA grant applications, state Workforce Investment Boards were invited to apply for workforce preparation grants to meet the needs of energy efficiency, renewable energy, and other green industries. The Office of Workforce Competitiveness provides administrative support and coordinates efforts for the partnership.

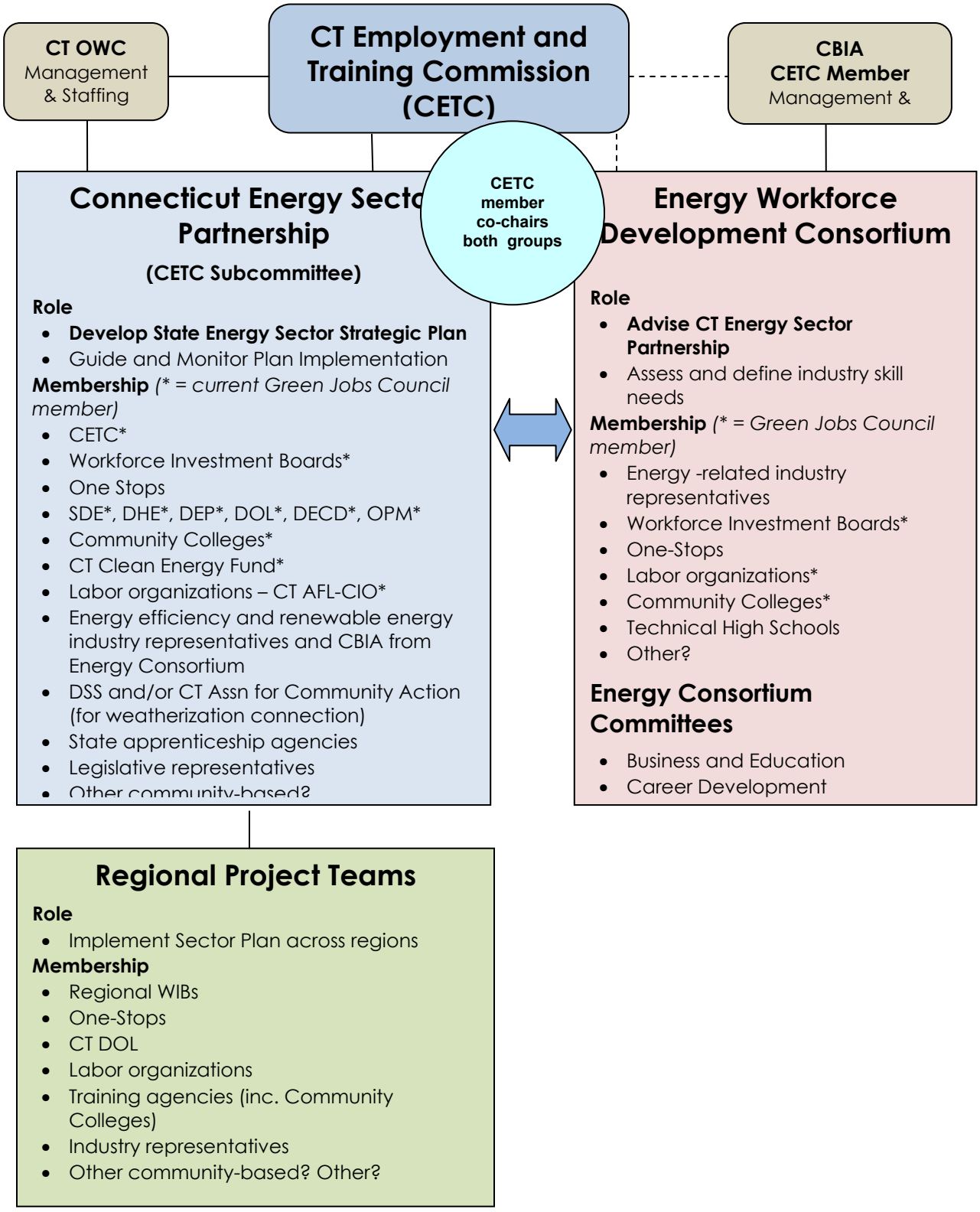
The Energy Workforce Development Consortium, which includes many of the same members of the Connecticut Energy Sector Partnership, is intended to advise the partnership and assess and define industry skill needs. Specifically, the consortium is charged with identifying challenges and developing solutions (with DECD) to meet the current and future workforce needs of energy-related companies in the state. The Connecticut Business and Industry Association staffs the consortium.

[2] The mission of the Connecticut Energy Workforce Development Consortium is to "define the industry's needs as it relates to workforce development, build awareness of the demand for energy personnel in the state, generate a sense of excitement around the industry, improve training programs to closely align classroom learning with workplace requirements, and create pathways to continuing education, certification and employment for high school and college graduates." Members include executives from traditional and alternative energy companies, manufacturers of energy-related products, workforce investment boards, and representatives from technical high schools, community colleges, and universities. The consortium is staffed by the Connecticut Business and Industry Association.

Third, the community college system was to expedite the creation of eight certificate credit programs and train 320 students within the next three years. A grant from the U.S. Department of Labor was recently awarded to Connecticut to support this effort (see SOAR grant in Table I-2)

Figure I-2. Connecticut Energy Sector Partnership Structure

(formerly Connecticut Green Collar Jobs Council)



Fourth, OWC was to provide administrative support and coordinate efforts among the many state agencies, public and independent colleges and universities, and quasi-public agencies whose missions include green collar industries and jobs. The OWC management and staffing role is shown in the Connecticut Energy Sector Partnership Structure in Figure I-2.

Beyond this executive order, the Governor's "Energy Vision" intends that 20 percent of all energy used and sold in the state will be from clean energy sources by the year 2020.[3]

Connecticut statutory changes driving the green movement. The demand for green collar jobs is consistent with Connecticut's energy utilization and conservation policy that requires the conservation of energy resources, and the development and utilization of renewable energy resources, such as solar and wind energy, to the maximum practicable extent (C.G.S. Sec. 16a-35k). There are also several new statutory requirements driving demand for green jobs. For example, *Connecticut is the first state with a required green building code for public and private buildings*. There are two recent public acts that promote the greening of Connecticut and are expected to increase the demand for a green collar workforce, particularly in the building sector. They are:

- P.A. 07-242 (An Act Concerning Electricity and Energy Efficiency) increases the state's "green building" requirements for new school, commercial, and government buildings. Regardless of whether the contractor/owner is receiving state funding/bonding, the construction is required to meet specific energy and environmental standards such as the LEED silver standard or its equivalent.

- P.A. 09-192 (An Act Concerning Green Building Standards and Energy Efficiency Requirements for Commercial and Residential Buildings) delays the date (to July 1, 2010) when "green building" standards are to take effect. New construction and renovation of commercial, school, and residential (5+ family units) buildings of a certain square footage will be required to be green by adhering to LEED silver certification or its equivalent (e.g., Green Globes), as specified in the newly revised state building code.

Additionally, P.A. 08-98, the 2008 Global Warming Law, codifies Governor Rell's energy vision, mandates reductions in state greenhouse gas emissions, and makes changes designed to help the state achieve these reductions.

Energy funds. More than a decade ago, two funds were established to promote use of clean energy and energy efficiency in Connecticut.

Connecticut Clean Energy Fund. As described in a previous program review study,[4] the Connecticut Clean Energy Fund (CCEF) was established in 1998 to provide financing for alternative sources of energy. Funded by a surcharge on electric utility bills and administered by Connecticut Innovations (a quasi-public agency), the fund's goals are to:

[3] Connecticut's Energy Vision for a Cleaner, Green State, Governor Jodi Rell's Energy Plan, 2006.
[4] "Energy Efficiency & Conservation Programs in Connecticut," Legislative Program Review and Investigations Committee, January 2009.

- create a clean energy supply for Connecticut,
- accelerate the development of clean energy technologies, and
- educate Connecticut consumers about the benefits and availability of clean energy.

The fund is undertaking initiatives in postsecondary education institutions. For example, under the direction of its FY09-FY10 Comprehensive Plan, CCEF intends to support community college initiatives through funding expensive equipment needed for training in renewable energy. Beneficiaries of this support will be Gateway and Naugatuck Valley community colleges, which have been identified as currently having the necessary laboratory setting and regional base from which to draw students. The fund also provides financial support to the University of Connecticut Center for Clean Energy Engineering (previously known as the Connecticut Global Fuel Cell Center).

The Connecticut Clean Energy Fund has several initiatives to introduce and potentially encourage students at the primary and secondary education level to consider careers in the green field. For example, the Learning for Clean Energy Innovation is a program that gives ninth grade teachers a broad knowledge of alternative energy sources. So that they may introduce these concepts into the classroom, to date, 180 teachers have participated in one-day workshops on solar photovoltaic energy. The solar education unit introduced at the workshop was developed in consultation with the State Department of Education, education experts and consultants, and the National Renewable Energy Laboratory. In 2009, the program also began offering professional development workshops on wind energy.

The Connecticut Clean Energy Fund Board of Directors recently approved funding for expansion of the Learning for Clean Energy Innovation program within Connecticut's technical high school system. The program will build teacher capacity to train students for clean energy jobs, focused on solar photovoltaic and solar thermal technologies, with shared equipment housed at three technical high schools (Wolcott, Grasso, and E.C. Goodwin).

Lastly, CCEF operates a Solar Photovoltaic (PV) Rebate Program to install solar energy products on residences, and on nonprofit and governmental sites. Requirements to become an installer for this program require PV-1 or E-1 licensure, having taken a PV installation training course, and completed at least three installations as the lead installer (or ten installations as an apprentice). As of November 2009, approximately 38 PV installers qualified to participate in this program.

Connecticut Energy Efficiency Fund. Connecticut has been nationally recognized as a leader in energy efficiency programs. For example, the American Council for an Energy-Efficiency Economy, a nonprofit policy and research organization that evaluates state energy efficiency programs, ranked Connecticut among the top three states in 2006 and 2008.

The Connecticut Energy Efficiency Fund (CEEF) was created by legislation in 1998 and, like CCEF, is funded by a surcharge on electric utility bills. Programs funded through CEEF are administered by the electric utilities (Connecticut Light & Power, and United Illuminating) in conjunction with the gas utilities (Connecticut Natural Gas, Southern Connecticut Gas, and Yankee

Gas). The purpose of CEEF is to advance efficient use of energy, reduce air pollution and other harmful environmental impacts, promote economic development, and provide energy security and affordability. Residents are offered incentives to replace older appliances with newer, more energy efficient models. Businesses are also encouraged to maximize energy efficiency and lower operating costs, keeping Connecticut employers competitive and in-state.

Private sector is driving the green movement. The private sector is another driver of the green movement. According to the director of the Institute for Sustainable Energy at Eastern Connecticut State University, there are only two commercial fuel cell companies in the world: United Technologies Corporation in South Windsor; and FuelCell Energy, Inc. in Danbury. Combined, the two companies have produced 400-500 units, including 10 fuel cell units in Connecticut.

There are a number of Connecticut companies that received ARRA grants. Bouffard Metal Goods of Waterbury, for example, received $5,000,000 for an electric drive vehicle battery components program. Schuco of Newington, a world leader in aluminum, steel, PVC-U and solar products for building envelopes, was recently chosen by one of Southern California's leading solar energy companies to supply products for major solar photovoltaic projects.

As companies make commitments to enter or expand in green areas, the workforce demand for green collar jobs increases. Additionally, the private sector partners with state agencies on the energy consortium, collaborates with college centers or institutes having a green focus, and serves on local advisory councils and energy fund boards.

Defining Green Collar Jobs

Beyond understanding what is *driving* the green movement, the second "D" is *defining* green collar jobs. Knowledge of which occupations are considered green collar jobs is a prerequisite to: estimating the size of the current green collar workforce; projecting future employer demand; and delivering education and training needed for green collar jobs.

There are a multitude of green collar job definitions produced by such entities as the U.S. Department of Labor, the Connecticut Department of Labor, Department of Economic and Community Development, and green job study groups and institutes. Table I-4 gives examples of some of the definitions of green collar jobs and the green field. While there is currently no single generally accepted definition of green collar jobs or the green field, there are some common themes. Five of the seven definitions shown, for example, specifically mention **improving or preserving the environment**. Four of the definitions reference **"energy"** in three different ways:

- saving energy/reducing energy usage;
- advancing new energy efficient technologies/increasing the efficiency of energy usage; and
- expanding the use of renewable energy/fostering more sustainable energy.

Table I-4. Various Definitions of Green Collar Jobs and the Green Field	
Source	**Definition**
DECD/DOL plan for green jobs in CT (per Executive Order No. 23)	Jobs that protect wildlife or ecosystems, reduce pollution or waste, or reduce energy usage and carbon emissions
Connecticut Department of Labor[1]	White and blue collar jobs in green businesses, whose products and services directly improve environmental quality
CT DOL Economic Digest, December 2008	Occupations with Standard Occupational Classification[2] definitions that indicate their direct contribution to preserving and enhancing the quality of the environment
Institute for Sustainable Energy at Eastern Connecticut State University[3]	• Jobs that preserve, restore, or improve the environment • Jobs that help save energy, advance new energy efficient technologies, and foster a more sustainable regional and national energy system • Either blue or white collar positions, updated to adopt sustainability as a core segment of the individuals' job description • Career opportunities capable of supporting a family's income, with the potential for advancement
Prepared by the National Center for O*NET (Occupational Information Network) Development for the U.S. DOL Employment and Training Administration	The green economy encompasses the economic activity related to reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy
Centers of Excellence of the California Community Colleges Economic and Workforce Development	An occupation that: • directly works with policies, information, materials, and/or technologies that contribute to minimizing environmental impact • requires specialized knowledge, skills, training, or experience in these areas
Working definition from the Workforce Information Council Green Jobs Study Group, with membership from the U.S. Bureau of Labor Statistics and seven state departments of labor[4]	Jobs in which the work is essential to products or services that improve energy efficiency, expand the use of renewable energy, or support environmental sustainability. The job involves work in any of these green economic activity categories: • renewable energy and alternative fuels • energy efficiency and conservation • pollution, waste and greenhouse gas (GHG) management, prevention, and reduction • environmental cleanup, remediation, waste clean-up, mitigations • sustainable agriculture and natural resource conservation • education, regulation, compliance, public awareness, and training and energy trading

[1]CT Career Resource Network Update, LMI, "CT's Blueprint for Green Collar Job Creation."

[2]The Standard Occupational Classification system, which is being adopted by all Federal statistical agencies for reporting occupational data, consists of 821 detailed occupations.

[3]In handouts distributed by the Institute for Sustainable Energy at the Hartford, New Haven and Fairfield County Federal Recovery Act Program--April 13, 14, and 17, 2009.

[4]Members included U.S. Bureau of Labor Statistics representatives, and state Department of Labor representatives from California, Colorado, Pennsylvania, Florida, New York, Connecticut, and Washington.

Preserving the environment is often linked with using less energy -- referred to as **energy efficiency** (EE) – and/or with using an alternative source of energy that is not harmful to the environment -- referred to as **renewable energy** (RE). It has previously been noted that Connecticut is a nationally recognized leader in energy efficiency programs. Also, *Connecticut was one of just seven states awarded a "Gold Star" standard by a national organization, signifying its continued search for new and innovative opportunities to reduce energy use, strengthen building codes and appliance standards, promote renewable energy, and lower polluting emissions from cars*.[5]

Many green collar jobs are linked to energy efficiency or renewable energy. Less energy use, for example, is a goal of weatherization installers and technicians. Fuel cell engineers, on the other hand, are striving to develop a renewable energy product that chemically produces electricity without emitting environmentally harmful exhausts and gases. Table I-5 shows energy efficiency and renewable energy technologies that are the focus of many green collar jobs.

Table I-5. Energy Efficiency and Renewable Energy Technologies

Energy Efficiency Technologies	Renewable Energy Technologies
• High efficiency heating, ventilation, and air conditioning • Efficient lighting • Efficient home appliances • Water heating • Commercial refrigeration • Pumps, motors, and drives • Building envelope • Demand response (e.g., reduce consumption at peak/critical times)	• Fuel cells • Solar (PV and solar hot water) • Wind • Geothermal • Hydrogen (<5ML) • Hydrogen • Biomass • Storage • Power grid infrastructure

Source: Connecticut Renewable Energy/Energy Efficiency Economy Baseline Study, Phase 1 Deliverable: Full Report, March 27, 2009, by Navigant Consulting, Inc.

Challenges in defining green collar jobs. As is apparent, *one of the challenges in this emerging field is the difficulty in defining exactly what constitutes a green job*. An economist with the Connecticut DOL noted that green encompasses many areas of the economy, and which occupations are considered green vary from day to day.[6] Green may also be thought of as a philosophy or growing movement (green washing of America) that can encompass nearly every occupation. For example, in a plan prepared by DECD and the state DOL to develop green industries and green jobs in Connecticut (as required by Executive Order No. 23), 119 green occupations were

[5] "America's Clean Energy Stars: State Actions Leading America to a New Energy Future," research report prepared by Environment America Research & Policy Center, 2007.
[6] "How 'Green' is Connecticut's Economy?" by Nicholas A. Jolly, Ph.D., Economist Connecticut DOL, December 2008 Connecticut Economic Digest.

identified including lawyers, janitors, and roofers.[7] A list of these 119 green occupations is provided in Appendix B.

Elements of many occupations will include the need to possess green skills as federal, state, and local environmental and energy requirements evolve. Also, as the Connecticut DOL Director of Research noted, as technology improves, what is considered green today can be even greener tomorrow—there is always more green you can do. Conversely, some narrowly define green collar jobs to specifically include only well-paying jobs able to support a family.[8]

One approach to dealing with the challenges in defining an emerging field is to group occupations by the way in which they are impacted by the green movement.

Grouping of green collar jobs. The U.S. Department of Labor has defined three general categories for occupations in the green economy:

1. Green *increased demand* occupations – existing occupations performed within a green setting;
2. Green *enhanced skills* occupations – existing occupations requiring additional green skills and knowledge, and perhaps new credentialing; and
3. Green *new and emerging* occupations – new occupations that arose due to the green economy.

Table I-6 provides examples of green occupations within each of the three U.S. DOL categories.

Table I-6. Examples within the Three U.S. DOL Green Occupational Categories

Increased Demand	Enhanced Skills	New & Emerging
Chemical Engineers	Electrical Engineers	Carbon Trading Analysts
Computer Software Engineers, Systems Software	Industrial Engineering Technicians	Fuel Cell Engineers
Construction Carpenters	Machinists	Solar Photovoltaic Installers
Electric Power-Line Installers and Repairers	Plumbers	Weatherization Installers and Technicians
Industrial Machinery Mechanics	Power Plant Operators	Wind Energy Engineers

Source: National Center for O*NET Development (www.onetcenter.org).

Additional new and emerging green collar occupations identified by the Institute for Sustainable Energy at Eastern Connecticut State University are listed in Appendix C.

Estimates of number of green collar jobs in Connecticut. While PRI staff may recommend future use of this U.S. Department of Labor definition of green collar jobs, *the present general lack of consensus on what constitutes a green collar job has led to a variety of estimates on the current size of Connecticut's green collar workforce, ranging from 5,493 to more than 22,000 individuals.*

[7] "Plan to Develop Green Industries and Green Jobs in Connecticut." Prepared by the Departments of Labor and Economic and Community Development, June 2009.
[8] Institute for Sustainable Energy at Eastern Connecticut State University.

Estimates of green collar occupations based on licensure, certification, and accreditation. Green collar jobs may also be defined through green licensure, certification, and accreditation. Table I-7 summarizes the types of green collar-related licenses, certificates, or accreditations and the number credentialed in Connecticut. (The licensing and certifying bodies will be described more fully later in this section.)

Table I-7. Credentials Held by Connecticut's Green Collar Workforce

License or Certificate or Accreditation	Source of Certificate or License	Number Certified or Licensed in Connecticut
Limited Licensed Solar Electric Contractors (PV-1)	DCP	15
Limited Licensed Solar Electric Journeypersons (PV-2)	DCP	13
Licensed Solar Thermal Contractors (ST-1)	DCP	93
Licensed Solar Thermal Limited Journeypersons (ST-2)	DCP	12
Building Performance Institute Accredited Contractors	BPI	2
Building Performance Institute Certified Technician	BPI	125
Business Energy Professional (BEP)	AEE	11
Certified Building Commissioning Professional (CBCP)	AEE	10
Certified Cogeneration Professional (CCP)	AEE	1
Certified Demand-Side Manager (CDSM)	AEE	10
Certified Energy Auditor (CEA)	AEE	15
Certified Energy Manager (CEM)	AEE	125
Certified Energy Procurement Professional (CEP)	AEE	14
Certified GeoExchange Designer (CGD)	AEE	8
Certified Indoor Air Quality Professional (CIAQP)	AEE	2
Certified Lighting Efficiency Professional (CLEP)	AEE	14
Certified Measurement & Verification Professional (CMVP)	AEE	3
Certified Power Quality Professional (CPQ)	AEE	2
Certified Carbon Reduction Manager (CRM)	AEE	6
Certified Sustainable Development Professional (CSDP)	AEE	13
Distributed Generation Certified Professional (DGCP)	AEE	4
Certified Energy Manager-In-Training (EMIT)	AEE	3
Certified Green Building Engineer (GBE)	AEE	7
Certified Solar PV Installers	NABCEP	8
Certified Solar Thermal Installer	NABCEP	1
Passed Entry Level (basic) Certificate Program Exam	NABCEP	27
LEED Green Associate	USGBC	29
LEED Green Advanced Professional	USGBC	1,214

Sources: Department of Consumer Protection, Building Performance Institute, Association of Energy Engineers, North American Board of Certified Energy Practitioners, U.S. Green Building Council.

Estimates of green collar jobs based on their contribution to environmental preservation and enhancement. Estimates of the current green collar workforce supply are produced by the Connecticut DOL based on Standard Occupational Classification (SOC) definitions, and choosing occupations that contribute directly to preserving and enhancing the quality of the environment. Using this methodology, there are 5,493 workers in green occupations in Connecticut (Table I-8). *The most plentiful green jobs are natural sciences managers, water and liquid waste treatment plant*

and system operators, and environmental engineers. Some of the occupations shown include coursework that would encompass green technology, but no specific license or certification is required.

Table I-8. Number Employed in Environmental Preservation and Enhancement Occupations

Occupation	Estimated Number Employed in 2006	Education Level Required
Natural Sciences Manager	933	Bachelor's plus work experience
Water & Liquid Waste Treatment Plant and System Operator	856	Long-Term On-The-Job Training
Environmental Engineer	747	Bachelor's
Environ. Scientist & Specialist	685	Master's
Environ. Science & Protection Tech.	392	Associate's
Nuclear Engineer	339	Bachelor's
Environmental Engineering Technician	216	Associate's
Nuclear Technician	195	Associate's
Power Plant Operator	175	Long-Term On-The-Job Training
Geoscientist	174	Master's
Nuclear Power Reactor Operator	108	Long-Term On-The-Job Training
Hydrologist	97	Master's
Other[a]	576	
Total	**5,493**	

[a]Includes agricultural engineers, soil and plant scientists, zoologists and wildlife biologists, conservation scientists, and foresters.
Source: Office of Research, Connecticut Department of Labor, December 2008 Economic Digest.

Estimates of green collar jobs based on employment in green industries. Another way the Connecticut DOL estimates the number employed in various green jobs is by counting, regardless of occupation, the number employed in a green industry, based on whether the North American Industry Classification System (NAICS) manual defines the particular industry as producing a product or service that contributes directly to preserving and enhancing the quality of the environment. Using this definition, Appendix D provides detailed information on the 22,373 Connecticut residents working in green industries. Staff from the Connecticut DOL said *while the greatest numbers of green jobs in Connecticut are currently in waste management and remediation, the most lucrative jobs are in hydroelectric power generation.*[9] A breakout of the jobs of the 1,691 residents employed in renewable energy, and the 2,675 employed in energy efficiency areas is also provided in the appendix.

Yet another Connecticut DOL definition of green jobs in Connecticut combined industry and occupational information, and concluded that *the largest increase in green employment would occur in the occupational category, "management, scientific, and technical consulting services"* (29 percent increase).

[9] Quoted in March 2, 2009 Hartford Courant article, "Green-collar Jobs': Two Rell Directives Would Create Environmentally Oriented Projects."

Summary. *Regardless of the methodology used to define green collar jobs, all show an increase in green jobs.* The Connecticut DOL believes there will be a need for engineers and scientists to continue to advance the utility of new alternative energy sources and the development and application of new green products; however, a much larger segment of the workforce will remain in their current occupations, but need to learn new skills and knowledge related to the production, installation, monitoring, maintenance and repair of these new green systems and products.

Regulation by the Department of Consumer Protection defining green collar jobs. Licensing of persons working in particular occupations becomes increasingly important in a new and emerging field such as green collar jobs. Licensing assures consumers that practitioners have a basic level of competency, although *there is currently very little regulation of these new and emerging occupations*.

The Connecticut Department of Consumer Protection (DCP) is authorized to issue licenses for work performed in three green/renewable energy areas: solar-thermal, solar-electric, and wind-electric. Table I-9 shows the requirements for, and work permitted under, each type of green license.

Until summer 2009, in order to perform solar thermal work, individuals were required to hold either ST-1 or ST-2 solar thermal licenses, which limit the individuals to perform solar thermal work only. Connecticut recently added an alternative option, which allows only certain licensed individuals that hold other types of heating/piping/cooling and plumbing/piping licenses (excluding all residential heating/piping/cooling limited S type licensed contractors and journeypersons), to obtain a certificate to perform solar thermal work, provided the individual has completed a solar thermal installation training course and passed a solar thermal work exam as approved by DCP (C.G.S. Sec. 20-334a).

Table I-9. Renewable Energy-Related State Licenses

License Number	License Name and Issuing Body	Requirements to Qualify for License	Work Permitted Under License
PV-1	• Limited solar electric contractor license • Issued by the Electrical Work Examining Board	2 years as licensed journeyperson or equivalent experience and training	• Limited to solar electricity systems • Includes wind generation systems
PV-2	• Limited solar electric journeyperson's license • Issued by the Electrical Work Examining Board	Completion of a registered apprenticeship program or at least 1 year or equivalent experience and training	• Limited to solar electricity systems under the employ of a contractor licensed for such work • Includes wind generation systems
ST-1	• Solar thermal contractor • Issued by the State Board of Heating, Piping, Cooling, and Sheet Metal Work Examiners	2 years as licensed journeyperson or equivalent experience and training	• Limited to solar hot water heating systems
ST-2	• Solar thermal limited journeyperson • Issued by the State Board of Heating, Piping, Cooling, and	Completion of a registered apprenticeship program or at least 1 year or equivalent	• Limited to solar hot water heating systems under the employ of a contractor licensed

	Sheet Metal Work Examiners	experience and training	for such work
Source: R.C.S.A. Sec. 20-332-2(m)(n), R.C.S.A. Sec. 20-332-5(hh)(ii).			

National green collar certifying organizations defining green collar jobs. *In addition to state licensing of occupations in the green field, there are also national certifying organizations that are attempting to define green collar jobs through the establishment of professional competency standards that are recognized by others in the green field.* In an emerging field, such external seals of approval offer assurances to prospective employers and clients.

Certification of *energy efficiency professionals and/or contractors* is offered by the Building Performance Institute and the Association of Energy Engineers. Certification of *renewable energy installers* is offered by the North American Board of Certified Energy Practitioners.

Building Performance Institute. The Building Performance Institute (BPI) is a contractor credentialing organization aimed at improving the energy efficiency (i.e., weatherization) of existing homes. In order for a company to receive certification, all employees must be BPI-certified professionals, having demonstrated knowledge of how to apply house-as-a-system techniques in upgrading the energy efficiency of homes. Independent BPI inspectors review paper files and randomly sample a percentage of sites for inspection. While no formal experience is necessary to participate in most of the required written and field exams, the BPI website recommends potential applicants obtain training from a BPI affiliate and have some experience in the building performance industry. Courses available for small homes certification are: building analyst, building envelope, manufactured housing, heating, and air conditioning/heat pump. A multifamily building certification is also offered, with available courses in multifamily building analyst, energy efficient multifamily building operators, multifamily hydronic heating system design, and multifamily advanced heating.

The Building Performance Institute's website notes that there were 70 training affiliate organizations nationally in January 2009, and 121 such organizations by September 1, 2009 (with 116 more organizations in the process of becoming training affiliates). The institute attributes the rapid growth in training home performance professionals to the funding for weatherization and energy efficiency retrofits provided under the American Recovery and Reinvestment Act of 2009: $5 billion through the Weatherization Assistance Program and another $3 billion from the State Energy Program. BPI certification is also required for Energy Star contractors, and is reportedly a preferred certification among employers in the building trades.[10]

There are currently two BPI-credentialed contractors in Connecticut and 125 certified professionals. Additionally, there are two BPI training affiliate organizations in Connecticut, with several out-of-state national companies also offering BPI training.

Association of Energy Engineers. The Association of Energy Engineers (AEE) is a nonprofit international professional society with a presence in 78 countries, and a dual mission of promoting the scientific and educational interests of professionals working in the energy industry and advancing sustainable development efforts. AEE has been certifying professionals since 1981,

[10] John J. Heldrich Center for Workforce Development Research Brief, "Preparing the Workforce for a "Green Jobs" Economy" by Jennifer Cleary and Allison Kopicki, February 2009.
Energy Star provides online training to contractors on energy efficient building design.

requiring applicants to meet specific educational and/or experience criteria, and pass a written exam. Certifications are awarded by AEE for:

- energy managers;
- sustainable development professionals;
- energy auditors;
- business energy professionals;
- energy procurement professionals;
- distributed general certified professionals;
- energy managers-in-training;
- carbon reduction managers;
- building commissioning professionals;
- measurement and verification professionals;
- lighting efficiency professionals;
- green building engineers; and
- power quality professionals.

According to the AEE website, the certified energy manager credential, for example, is widely accepted and recognized by the U.S. Department of Energy, Office of Federal Energy Management Programs, and the U.S. Agency for International Development.[11] It is the standard for qualifying energy professionals in the United States and internationally. There are currently 125 certified energy managers (CEM) in Connecticut; as outlined in a recently submitted grant to the U.S. Department of Labor, Connecticut is estimated to need another 70-100 CEMs in the future. If funded, certification training will occur at several of the community colleges, where there are faculty members with certification to train and help students prepare for the four-hour CEM certification exam (estimated to have a 30 percent passage rate on the first try).

Table I-10 shows the number of Connecticut residents with certification in each of the areas. There are a total of 166 residents with at least one certification; some residents have multiple certifications.

Table I-10. Number of Connecticut Residents with AEE Certification as of October 2009

Certification	Count
Business Energy Professional (BEP)	11
Certified Building Commissioning Professional (CBCP)	10
Certified Cogeneration Professional (CCP)	1
Certified Demand-Side Manager (CDSM)	10
Certified Energy Auditor (CEA)	15
Certified Energy Manager (CEM)	125
Certified Energy Procurement Professional (CEP)	14
Certified GeoExchange Designer (CGD)	8
Certified Indoor Air Quality Professional (CIAQP)	2
Certified Lighting Efficiency Professional (CLEP)	14

[11] www.aee.center.org/certification/CEM/page.htm. (October 2009)

Certified Measurement & Verification Professional (CMVP)	3
Certified Power Quality Professional (CPQ)	2
Carbon Reduction Manager (CRM)	6
Certified Sustainable Development Professional (CSDP)	13
Distributed Generation Certified Professional (DGCP)	4
Energy Manager-In-Training (EMIT)	3
Green Building Engineer (GBE)	7
TOTAL	**248**
Source: PRI staff communication with Association of Energy Engineers staff.	

North American Board of Certified Energy Practitioners. The North American Board of Certified Energy Practitioners (NABCEP) is the national organization that certifies professional installers in the field of renewable energy. Certification is based on training and passage of an exam demonstrating knowledge of standards set by subject matter experts. Nationally, there are 936 certified solar photovoltaic (PV) installers and 112 certified solar thermal installers as of September 2009.

NABCEP has awarded solar PV installer certificates to eight Connecticut residents and solar thermal installer certification to one Connecticut resident. In addition to these two types of certification, small wind certification may become available in approximately six months.

Gateway Community College is listed as the only registered Connecticut provider of training for the NABCEP entry-level PV exam, which tests basic understanding of PV systems. Passing the exam results in receipt of a NABCEP basic certificate, which gets the graduate onto the worksite to gain the experience needed to sit for the more advanced NABCEP photovoltaic certificate.

To date, Gateway has administered the entry-level exam once, which was passed by 12 of its students. There are 15 additional Connecticut residents who have passed the entry-level exam after having taken coursework available from one of the other providers in the northeast region. Other states have many more NABCEP training providers. Massachusetts, for example, has nine providers (six of which are community colleges), and New York has 11 providers (six of which are at 2- or 4-year colleges).

In order to sit for the more advanced Installer Certification Exam, one must have been the lead installer for two PV systems and have received at least 40 hours of advanced PV training. The training can come from a variety of sources including community colleges or universities, independent training providers with ISPQ (Institute for Sustainable Power Quality) accreditation, apprenticeship training programs, vocational/technical schools, or industry in-house training programs.

U.S. Green Building Council. The U.S. Green Building Council (USGBC) is a nonprofit organization with a goal of making green buildings available to everyone within a generation. To that end, the USGBC administers the Leadership in Energy and Environmental Design (LEED) certification program, a rating system that assesses the environmental sustainability of new and existing buildings.

In evaluating the level of energy and environmental design of a building, according to the council's website, LEED "…provides independent, third-party verification that a building project meets the highest green building and performance measures."[12]

The LEED rating system has a maximum of 69 possible points, with more points signifying increasingly more green features. Buildings are certified as follows:

1. base certification 26-32 points;
2. silver certification 33-38 points;
3. gold certification 39-51 points; and
4. platinum certification 52-69 points.

Some of the points given to buildings (or communities) depend on the extent to which buildings are designed and built to improve:

- energy savings;
- water efficiency;
- carbon dioxide (CO_2) emissions reduction;
- indoor environmental quality; and
- stewardship of resources and sensitivity to their impacts.

A list of the 42 Connecticut buildings with LEED certification as of November 2009 is found in Appendix E. Many of the buildings are located on the campuses of boarding schools or colleges; there are also supermarkets and large corporations on the list.

Additionally, the U.S. Green Building Council certifies LEED professionals. The recently established LEED green associate credential is given in non-technical fields of practice to individuals who have demonstrated green building expertise by passing a USGBC exam. The LEED AP (advanced profession) certification is given to persons who have demonstrated advanced depth of knowledge in green building practices on a national exam and also have documented, professional experience on a LEED project within the last three years. As of November 2009, Connecticut had 29 people credentialed at the LEED green associate level and 1,214 credentialed at the LEED AP level.

The *Connecticut Green Building Council* is a state chapter of the U.S. Green Building Council. It is a nonprofit organization that promotes the construction of high performance energy efficient buildings in Connecticut. Efforts include:

- holding a series of workshops on green building topics;

[12] http://www.usgbc.org. (November 2009).

- maintaining a speaker's bureau, and sponsoring educational forums and seminars on green building; and
- periodically offering Connecticut-based LEED training in cooperation with the U.S. Green Building Council.

Developing the Green Collar Field and Future Job Opportunities

Who is developing the green field? In addition to *driving* the green movement and *defining* green collar jobs, the third "D" is *developing* the green collar field and future job opportunities. The promotion and development of the green collar field by several state agencies, business associations, and private companies is now discussed.

Role of state workforce development agencies in developing the green collar field. *There are many state agencies and private organizations working on green collar job initiatives in Connecticut.* In part because of federal requirements pertaining to ARRA grant submissions, *there are consortiums and partnerships currently being formed or shaped*, often expanding to include more key stakeholders. While these agencies and organizations have many responsibilities, Table I-11 focuses on each state agency's role in developing green collar job opportunities in Connecticut, either directly or indirectly.

Roles of other organizations in developing the green collar field. Besides the entities just described, there are other organizations that play a role in developing green collar job opportunities in Connecticut. The *Connecticut Business and Industry Association* (CBIA), for example, representing 10,000 Connecticut companies, has staffed the aforementioned Energy Workforce Development Consortium and established an Environmental Policies Council to connect businesses with environmental experts, regulators, and state and federal policymakers. The association has also developed a virtual Green Business Center that features green vendors, news, best practices, and incentives for CBIA member companies. The CBIA Education Foundation has helped design curriculum for Hartford High School's Academy of Engineering and Green Technology.

The Connecticut Business and Industry Association also periodically surveys members regarding sustainability and green business practices. In the most recent survey, CBIA found 73 percent of respondents reported engaging in green/sustainable practices in 2009, a sharp increase from the 59 percent in 2008 and 47 percent in 2007.

Some of *Connecticut's companies* play a role in developing green collar job opportunities. United Technologies Corporation, solar panel companies, and fuel cell companies, among others, are generating green jobs as their businesses expand, due in part to ARRA funds and state tax and other incentives. FuelCell Energy, Inc. of Danbury, for example, was recently awarded $1.5 million by the

U.S. Department of Defense[13] to continue development of its electrochemical hydrogen separator, which has industrial and transportation applications. Apollo Solar of Bethel was awarded $1.5 million by the U.S. Department of Energy to develop commercial-ready solar power technology for development of nationwide solar energy grid integration systems.

Where will future green collar job opportunities be? The Connecticut DOL estimated the current and projected number employed in various green occupations. Of all the green occupations examined, only the demand for nuclear engineers and power plant operators is expected to decline during the next decade (Table I-12).

Table I-11. Roles of State Agencies in Developing Green Collar Job Opportunities in Connecticut

State Agency	Role(s)
Connecticut Department of Labor	• Plays key role in projecting numbers employed currently and in the future green collar workforce • Recently approved U.S. DOL grant will allow CT DOL to work with neighboring states to identify job vacancies and green collar jobs in greatest demand • Work with Workforce Investment Boards to obtain training for under- and unemployed individuals, particularly in weatherization installation, energy audit field • Establishment of a 21st Century Green Jobs Training Initiative, which shall provide training to meet the needs of the energy industry and other green industry
Connecticut Office of Workforce Competitiveness	• Manages and staffs Connecticut Employment and Training Commission and its Connecticut Energy Sector Partnership (formerly Green Jobs Council), charged with developing green job opportunities and establish training programs • Soon to be established Green Science and Engineering Advisory Group to develop strategies for introducing green principles into education, manufacturing, engineering, and other aspects of business and industry, and to leverage resources available to Connecticut through its universities • Provide administrative support and coordinate efforts among state agencies, public and private colleges and universities, and quasi-public agencies whose missions relate to green collar industries and jobs
Connecticut Office of Policy and Management	• Energy division has key role in securing the ARRA green funds • May reallocate existing job training funds within the Secretary's discretion, to the new 21st Century Green Jobs Training Initiative
Department of Social Services	• Designated to receive U.S. Department of Energy block grants for weatherization • Operates the Weatherization Assistance Program (WAP), the purpose of which is to help low-income residents reduce their energy bills by making their homes more energy efficient. Weatherization is performed through the CAP agencies.
Department of Economic and Community Development	• Gives priority to projects incorporating clean and green energy through its awarding of monies from the Small Manufacturers Competitiveness Fund • Under contract with CCEF, conducted an economic and fiscal impact analysis of the renewable energy and energy efficiency industry group on the state's economy
State Department of Education	• Planning currently underway to create a Green Collar Corps • Purpose is to teach primarily high school students the skills needed to help their communities decrease their environmental and energy footprint

[13] U.S. Department of Defense Engineer Research and Development Center's Construction Engineering Research Laboratory.

	• The Corps will be trained to conduct energy audits for residential and commercial businesses • Priority will be given to the enhancement and expansion of the technical high school system's model green jobs programs
Connecticut Innovations, Inc.	• Expand the Accelerator at Science Park to include green technology companies
Department of Transportation	• In consultation with DECD and DAS, develop a plan to implement a green transportation corridor along interstate routes 91 and 95 • The plan will find opportunities to require green improvements, including use and distribution of alternative energy sources along the green transportation corridor
Dept. of Env. Protection	• Develop a plan for the installation of green technology at all state parks

Source: PRI staff analysis.

Table I-12. Growth in Connecticut's Green Occupations

Occupation	Estimated Number Employed in 2006	Projected Number Employed in 2016	Demand
Hydrologist	97	121	↑25%
Geoscientist	174	209	↑20%
Environmental Engineer	747	891	↑19%
Environ. Science & Protection Tech.	392	458	↑17%
Environmental Engineering Technician	216	248	↑15%
Natural Sciences Manager	933	1,062	↑14%
Water & Liquid Waste Treatment Plant & System Operator	856	955	↑12%
Environ. Scientist & Specialist	685	761	↑11%
Nuclear Power Reactor Operator	108	113	↑5%
Nuclear Technician	195	197	↑1%
Nuclear Engineer	339	335	↓1%
Power Plant Operator	175	169	↓3%
Other[a]	576	629	↑9%
Total	**5,493**	**6,148**	**↑12%**

[a]Includes agricultural engineers, soil and plant scientists, zoologists and wildlife biologists, conservation scientists, and foresters.
Source: Office of Research, Connecticut Department of Labor, December 2008 Economic Digest.

Another source of projections, the Advanced Technology Environmental and Energy Center,[14] predicts most green collar job opportunities to be in:

- building and selling energy-related products;
- building energy assessment;
- energy efficient building construction;
- building operations and maintenance;
- project engineering and implementation;

[14] The Advanced Technology Environmental and Energy Center (ATEEC) is a national center that promotes and supports environmental and energy technology education to address the needs of the national and global workforce.

- energy transmission and distribution; and
- transportation systems and services.

Lastly, a recent Connecticut job-training grant application[15] prepared by the Connecticut Energy Training Partnership, projected the following annual openings in key energy efficiency and renewable energy sectors:

- energy-efficient building, construction, assessment, and retrofit (2,775 jobs);
- deconstruction and materials use (2,124 jobs);
- environmental protection/clean water (occupations include carpenters, electricians, glaziers, maintenance/repair, ironworkers, finishing trades, laborers, environmental technicians) (1,683 jobs);
- solar and wind (2,065 jobs);
- fuel cell (493 jobs); and
- biofuels (occupations include electrical and electronics, environmental and chemical technicians, and advanced manufacturing) (306 jobs).

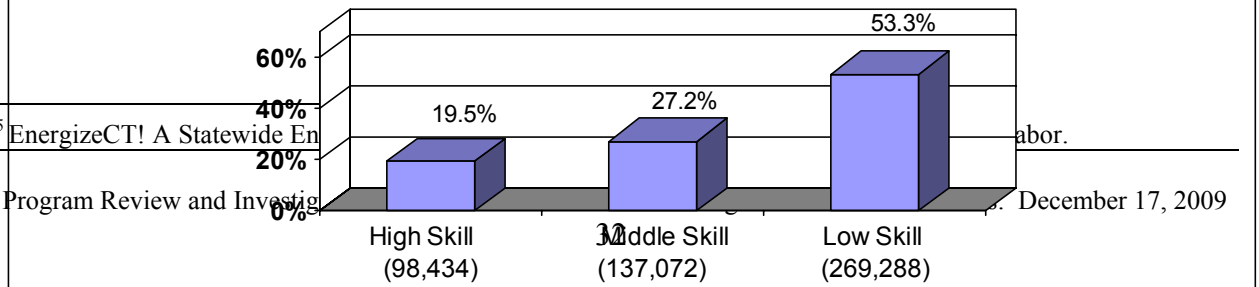
Delivering Education and Training for Green Collar Jobs

Until now, this section has described the forces *driving* the green movement, the many *definitions* of green collar jobs, and the players involved in *developing* the green collar field and future job opportunities. The fourth "D" of the green collar field is *delivering* education and training for green collar jobs. The various training programs resulting from ARRA stimulus funds are providing existing workers with additional green skills and knowledge, and sometimes additional credentialing or certification. The ARRA funds are also providing unemployed and underemployed people with entry level jobs in such areas as weatherization and green construction.

All public postsecondary education institutions, many independent colleges and proprietary schools, and the technical high schools play a role in delivering education and training individuals for green collar jobs. *Although there is no consensus on the definition of green jobs, the occupations discussed in this section require a range of education and training levels, from less than a high school diploma to a graduate degree.* While the focus of the PRI study is on jobs requiring postsecondary education, career ladders and lattices are an important aspect of the continuum of green collar jobs. Therefore, a discussion of certain green collar occupations requiring on-the-job or other (non-college) training is also included.

Using the Connecticut Department of Labor comprehensive working definition of green occupations, which lists 119 green occupations including lawyers, janitors, and roofers, Figure I-3 shows *approximately one in five green collar jobs requires a bachelor's degree or higher* (high skill

Figure I-3. Educational and Skill Level of Green Collar Jobs



Source: CT DOL Occupations in a Green Industry Report, April 2009.

[15] EnergizeCT! A Statewide En abor.

level) and *one-quarter either an associate's degree, postsecondary vocational training, or long-term on-the-job training* (middle skill level). *Over half* of the green collar jobs, however, *do not require any postsecondary education or extensive on-the-job training* (low skill level).

Because the entry level job salaries are often unable to support a family, *these low skill level jobs can be viewed as part of a career ladder or lattice*, where continuing education, training, and experience lead to financially adequate jobs. Further, while much of the explosion of weatherization jobs is being driven by ARRA funding, it is possible that demand for weatherization jobs will decrease as federal funding is withdrawn. Thus, career ladders and lattices play an increasingly important role in the green energy field.

Green collar career ladders and lattices. Figure I-4 summarizes the green collar educational continuum and the roles various state institutions and agencies may play in the preparation of the green collar workforce. Although not included in this diagram, independent colleges, nonprofit agencies, businesses, and others also play a role in the preparation of the green collar workforce. The roles of the many partners in this effort are described later in this section.

Career ladders and lattices are made up of a group of related jobs that comprise a career. Figure I-5 shows an example of a possible green collar career ladder. Many of the entry-level positions are in the weatherization field. With the recent Connecticut Department of Social Services $64 million grant from the U.S. Department of Energy for the Weatherization Assistance Program, that trend will continue. Thus, someone starting out may enter the green collar field with a position as a weatherization worker at a wage averaging $12-$14.70 per hour, depending on the county within Connecticut[16], and with further education, advance to an energy auditor, earning approximately $31.25 per hour. While career ladders lay out a series of advancing jobs within a given industry, career lattices offer workers the flexibility of taking jobs either within the same industry or in a different industry. A sampling of average salaries and educational requirements for some of the new and emerging green collar occupations is provided in Appendix F.

Near future workforce supply. Initiatives to train Connecticut's green collar workforce are occurring at Connecticut's public community college system, state college system, and the University of Connecticut. Independent postsecondary education institutions are also involved in the training of Connecticut's green collar workforce, as are the technical high schools, Connecticut Clean Energy Fund, for-profit institutes, unions, and national training organizations.

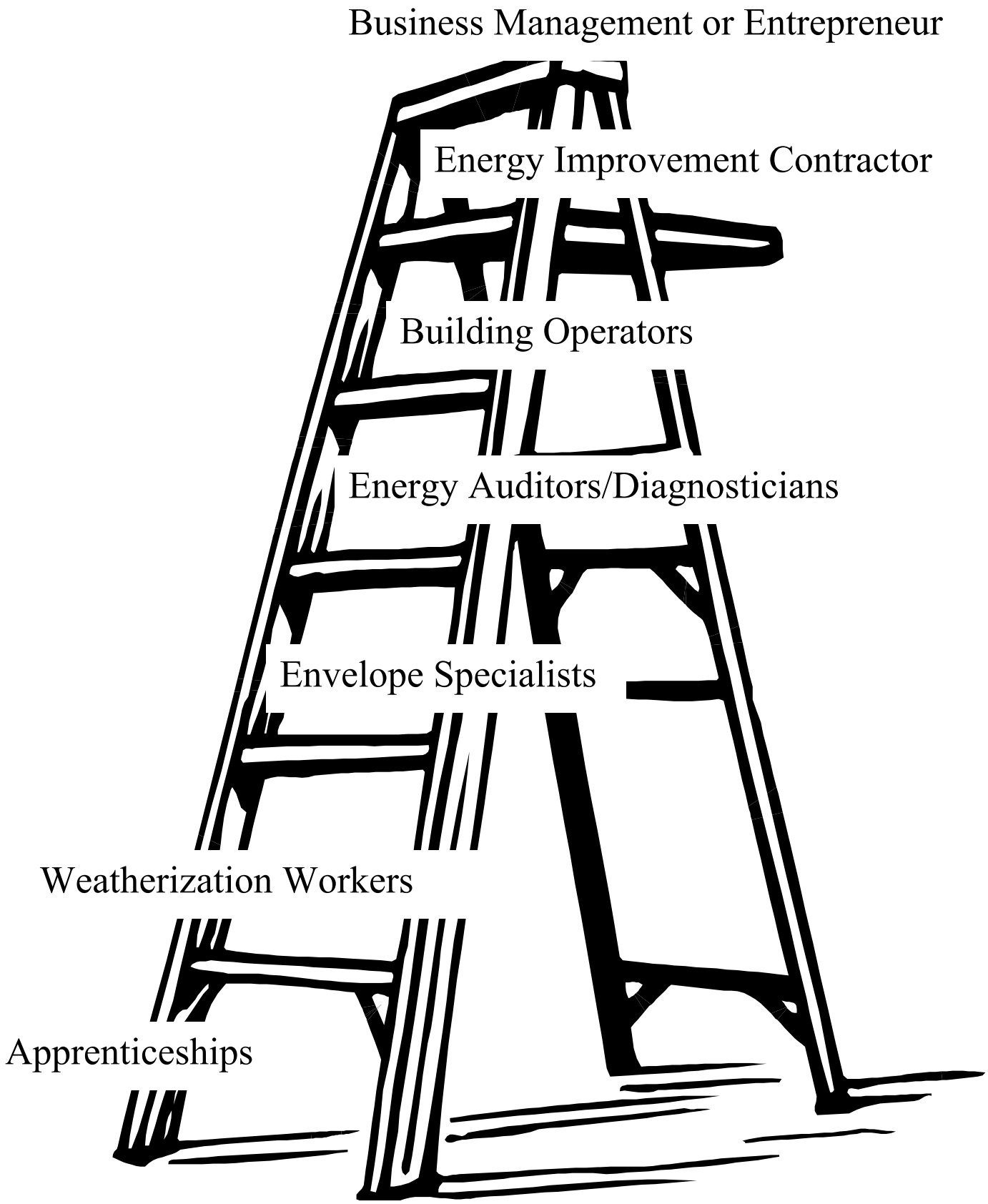
Beyond traditional students, there are current members of the workforce taking courses or obtaining certificates to enhance skill sets with green knowledge and technology. As noted earlier, two of the three green collar job categories defined by the U.S. DOL pertain to: existing occupations conducted within a green setting; and existing occupations requiring additional green skills and knowledge. Occupations in the first category (that require postsecondary education) are already being offered at colleges. Occupation in the latter category may simply require supplementary college courses, or green applications within existing college courses.

[16] The Davis-Bacon Act requires Connecticut and other states receiving ARRA funds to pay prevailing wages for various weatherization-related jobs.

Figure I-4. Green Collar Educational Continuum

Source: Institute for Sustainable Energy at Eastern Connecticut State University

Figure I-5. Potential Green Collar Career Ladder



Source: Building a Green Collar Workforce, The Institute for Sustainable Energy at Eastern Connecticut State University.

There are students currently in college preparing for specific green collar occupations. Table I-13 identifies Connecticut postsecondary education institutions singled out by Navigant Consulting, Inc., as having employees engaged directly in EE/RE postsecondary teaching and/or research.

Table I-13. Higher Education Institutions with Employees Engaged Directly in EE/RE Research and/or Postsecondary Teaching

Institution	Type
Manchester Community College	Public community college
Three Rivers Community College	Public community college
Naugatuck Valley Community College	Public community college
Central Connecticut State University	Public four-year state university
Eastern Connecticut State University	Public four-year state university
University of Connecticut at Storrs	Public land-sea-grant university
Fairfield University	Independent university
Saint Joseph College	Independent university (college)
Quinnipiac University	Independent university
University of Bridgeport	Independent university
University of Hartford	Independent university
Yale University	Independent university

Source: Connecticut Renewable Energy/Energy Efficiency Economy Baseline Study Phase 1, March 27, 2009, Navigant Consulting, Inc.

Overall, the higher education institutions are contributing to creation of the near future green collar workforce in one of five ways:

1. offering majors or minors in directly related fields such as environmental science or environmental engineering;
2. offering majors or minors associated with the green movement;
3. establishing centers or institutes directly related to renewable energy, energy efficiency, or other green related areas;
4. offering certificates in green collar fields; and
5. offering individual courses to add green collar skills and/or knowledge.

A description is now provided of each of these the kinds of efforts.

1) Offering "environmental" majors. Table I-14 shows the 16 Connecticut colleges with an environmental major, such as environmental studies, environmental science, and forestry and environmental studies, and the number of degrees conferred. A minor in one of these environmental areas is offered by many of these 16 colleges and also other higher education institutions not offering an environmental major. Both Eastern and Southern Connecticut State Universities, for example, offer both majors and minors in environmental earth science.

There may also be multiple colleges within a university offering environmental majors or minors. The University of Connecticut, for example, has students in the colleges of agriculture and natural resources, engineering, and liberal arts and sciences, all studying fields with a primary focus

Table I-14. Number of Degrees Awarded in 2007-2008 in "Environmental" Programs			
College	**Degree Type**	**Program Name**	**Number Awarded**
Connecticut College	Bachelor's	Environmental Chemistry	1
	Bachelor's	Environmental Studies	15
Eastern CSU	Bachelor's	Environmental Earth Science	11
Gateway CC	Associate's	Environmental Science & Toxicology	1
Middlesex CC	Associate's	Environmental Science	2
	Associate's	Environmental Science: Biotechnology	5
Naugatuck Valley CC	Associate's	Environmental Science: Biology	3
Sacred Heart University	Bachelor's	Environmental Science	3
Saint Joseph College	Bachelor's	Environmental Science	1
Southern CSU	Master's	Environmental Education	11
Three Rivers CC	Associate's	Environmental Engineering Technology	3
Trinity College	Bachelor's	Environmental Science	6
UConn	Doctorate	Environmental Engineering	1
	Master's	Environmental Engineering	6
	Bachelor's	Environmental Engineering	4
	Bachelor's	Environmental Science	19
University of Hartford	Master's	Environmental Engineering	5
University of New Haven	Master's	Environmental Engineering	12
	Master's	Environmental Science	3
	Bachelor's	Environmental Science	1
Wesleyan University	Master's	Earth & Environmental Studies	3
	Bachelor's	Earth & Environmental Science	12
Western CSU	Master's	Biological & Environmental Sciences	5
Yale University	Bachelor's	Engineering Science-Environmental Engineering	3
	Master's	Environmental Engineering	13
	Doctorate	Environmental Engineering	5
	Bachelor's	Environmental Studies	9
	Master's	Forestry & Environmental Studies	121
	Doctorate	Forestry & Environmental Studies	5
TOTAL			289
Source: Connecticut Department of Higher Education Degree Completion Database.			

on the environment (e.g., environmental engineering, environmental science). Striking growth was seen in the environmental major in the College of Agriculture and Natural Resources, where there was a 75 percent increase in the number of environmental science majors from fall 2008 (36 students) to fall 2009 (63 students).[17]

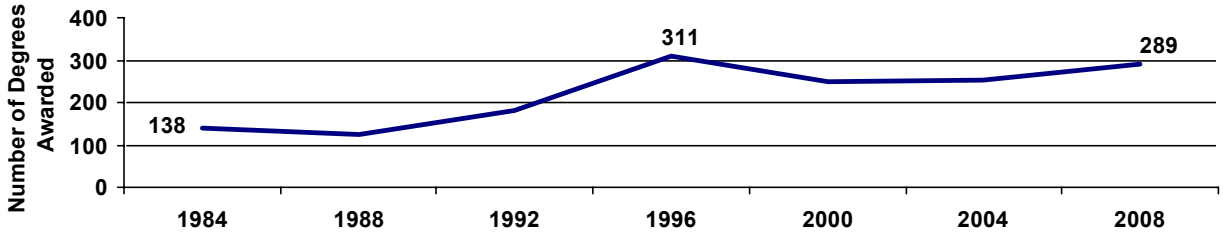
[17] University of Connecticut Green Research, Outreach and Academic Programs, report prepared by the University of Connecticut for the Legislative Program Review and Investigations Committee (October 2009).

Two additional colleges have started offering green majors to students. Trinity College recently reported[18] having added a new major in environmental science, and Goodwin College reported adding an associate degree in environmental science, and certificates in:

- brownfield remediation;
- riverine ecology;
- water distribution operations;
- water treatment operations; and
- environmental health technician.

On the other hand, in the same recent survey, Sacred Heart University and Saint Joseph College both reported discontinuation of the bachelor degree in Environmental Science due to declining/low student enrollment (see Appendix G for a summary of the CCIC survey results). *Overall*, however, *there has been an increase in the number of environmental degrees conferred, particularly in comparison to the number of such degrees awarded in the 1980s* (Figure I-6).

Figure I-6. Number of "Environmental" College Degrees Awarded



Source: CT Department of Higher Education Degree Completion Database.

2) Offering majors or minors associated with the green movement. Beyond the limited number of "environmental" majors, there are a variety of other majors that are considered green, depending on the person or organization making the determination. Regardless of whether the major is considered green, as has been discussed previously in this section, a green component has been added to many other majors. The California Community Colleges Centers of Excellence Economic and Workforce Development believes there are few specific new programs for green jobs, such as technical level jobs for specific trades (i.e., wind, solar, geothermal) that need to be created. The center instead recommends that colleges embed a green curriculum or green thread throughout all courses.[19]

Some of the majors frequently considered green or associated with the green movement by the Institute for Sustainable Energy at Eastern Connecticut State University include:

[18] Connecticut Conference of Independent Colleges Survey for the PRI Study of the Alignment of Postsecondary Education and Employment, July 2009.
[19] Understanding the Green Jobs: Tools and Resources, California Community Colleges Centers of Excellence Economic and Workforce Development.

- marine biology, marine chemistry, maritime studies, and coastal studies;
- landscape architecture, ornamental horticulture and turf grass management;
- geology;
- chemical engineering, civil engineering, electrical engineering, and mechanical engineering;
- forest science;
- meteorology;
- environmental economics; and
- construction management, and energy management and policy.

3) Establishing centers or institutes directly related to renewable energy, energy efficiency, or other green areas. Centers or institutes directly related to the environment, renewable energy, energy efficiency, or other green areas are found within every Connecticut college system. A description of each now follows.

Institute for Sustainable Energy at Eastern Connecticut State University. Established by the Board of Trustees of the Connecticut State University System in 2001, the Institute for Sustainable Energy at Eastern Connecticut State University is a cornerstone of the green initiative. The institute focuses on matters relating to energy education, energy policy, energy efficiency, energy conservation and load management, renewable energy, distributed generation, protection of environmental resources, and the dissemination of information on energy alternatives and sustainability to users and providers of energy. The mission of the institute is "…to be an objective energy and educational resource regarding the means for achieving a sustainable energy future for Connecticut."[20]

Staffed by a director, educational and technical specialists, and an assistant, more than a dozen ECSU students obtain exposure and real world experience in the green field each year. The institute's educational efforts have included development of an educational website called Connecticut Energy Education (www.ctenergyeducation.com). This site contains information for educators featuring the energy topics in the Connecticut high school curriculum. Building Inspector Energy Code Standards Training is also offered by the institute.

The Center for Clean Energy at the University of Connecticut. The University of Connecticut trains students for green collar careers and also conducts research in its Center for Clean Energy. Formerly called the Connecticut Global Fuel Cell Center, the center recently changed its name to reflect a larger scope of interest that encompasses emerging energy technology areas such as biofuels, coal gasification, natural resource conservation, power management, and smart power transmission. As announced on the center website (www.ctfuelcell.uconn.edu), this expansion is expected to leverage the center's "…core strength and leadership in the field of advanced fuel cell technologies and power generation systems and enables our students and faculty to better address the global energy and environmental needs."

[20] http://www.easternct.edu/sustainenergy/about_us/mission_statement.html (November 2009).

The Center is operated by the University of Connecticut School of Engineering, and has recently added a new director and six faculty members. The center partners with and/or is funded by, the U.S. Departments of Energy and Defense, the National Science Foundation, the Connecticut Clean Energy Fund, UTC Power and Proton Energy Systems, and others. Students have the opportunity to learn about the green field through research with center faculty.

Center for a Sustainable Future at Gateway Community College. Established in 2009, the Center for a Sustainable Future at Gateway Community College offers courses in sustainable operations. Providing hands-on practical skills training, certificates are offered in solar energy technologies (completed by 78 students to date) and alternative energy transportation. Building performance certificates and clean water treatment plant classes are also offered. According to its website, the Center is positioning itself to prepare the in-state green workforce of the future, taking an integral role in "…the sustainable economic development of the State of Connecticut, facilitating the transition to renewable energy sources, sustainable building development, energy efficiency programs, alternative transportation technologies, water management, and numerous other sustainable initiatives."[21]

Clean Energy Institute at the University of Hartford. The Clean Energy Institute is a branch of the University of Hartford, Engineering Applications Center. Involving five full-time faculty with experience in both academia and industry, two part-time faculty from local industries, and six undergraduate and graduate students, the institute is currently working on energy-related projects that include:

- parabolic solar collector;
- development of solid absorbents for the capture of greenhouse gasses;
- use of biodiesel fuel in a university bus;
- design and testing of passive coolant devices for photovoltaic cells;
- comparison between predicted and measured power and a series of photovoltaic array; and
- novel ejector/condenser to compress vapor in liquid/vapor air conditioner.

4) Certificates in green collar fields. As described earlier, several approved and pending ARRA grants are expected to help unemployed and underemployed workers earn certificates in emerging green collar fields. In anticipation of those opportunities, and demand for such certificates from businesses and students, there are several certificate programs currently underway at several of the community colleges (see Appendix H for a comprehensive list of green certificates (and degrees) offered at each of the Connecticut community colleges). Also, two- and four-year colleges are considering including the earning of one or more certificates as an option for students enrolled in related associate and bachelor degree programs. Table I-15 shows the number of initial community college students who were enrolled or awarded a certificate in an environmental or green program in 2007-2008.

[21] http://www.gwcc.commnet.edu/uploadedFiles/Corporate_and_Continuing_Education/CSF%20Credit%20Course%20Fall%2009%20Schedule.pdf. (November 2009).

Table I-15. Number of Students in 2007-2008 Enrolled or Awarded Certificates in "Environmental" Programs			
College	**Certificate Name**	**Number Enrolled**	**Number Awarded**
Gateway CC	Wastewater Management	1	0
Gateway CC	Water Management	10	3
Gateway CC	Alternative Fuel Vehicle	1	1
Naugatuck Valley CC	Advanced Wastewater	1	0
TOTAL		13	4
Source: Assistant Chancellor of Connecticut Community College System.			

Due to state plans and federal stimulus funding, the figures are expected to rise significantly. Table I-16, for example, shows the green certificate programs, including those under development, at particular community colleges as part of the federal grant, SOAR. With the exception of the Three Rivers Community College certificate programs begun in the fall 2009 semester, the certificate programs are anticipated to begin in the spring 2010 semester.

Table I-16. Green Certificate Programs Under Development at Connecticut Community Colleges as Part of U.S. Department of Labor Grant, Project SOAR	
Community College	**Certificate**
Three Rivers Community College	• Sustainable Facilities Management • Sustainable Landscape Ecology & Conservation Technician
Norwalk Community College	• Building Efficiency & Sustainable Technologies Certificate/Sustainable Facilities Management
Gateway Community College	• Alternative Energy Transportation • Clean Water Treatment • Solar Energy Technologies
Naugatuck Valley Community College	• Alternative Energy Systems
Manchester Community College	• Sustainable Energy Certificate
Source: USDOL Community-Based Job Training Grant, "Sustainable Operations: Alternative and Renewable (SOAR) Energy Initiative."	

Features of the SOAR grant-funded certificate programs include: enhanced learning technology; increased instructional supports; tuition assistance; tutoring; and academic and career counseling. The Sustainable Landscape Ecology & Conservation Technician certificate, for example, requires 24-24.5 credits, usually taken over two semesters. The objective of the certificate is to provide students with entry-level skills needed to fill technician jobs in the areas of sustainable landscape design, planning, and conservation.

Many current Three Rivers Community College students studying for an associate degree in environmental engineering technology have expressed interest in obtaining a sustainable landscape ecology and conservation technician certificate, which would be achieved through completion of three additional courses. In developing career ladder opportunities, the program coordinator has been

working with representatives of the University of Connecticut College of Agriculture to accept the Three Rivers Community College courses for students wishing to transfer and obtain a bachelor's degree in either Plant Sciences or Natural Resources and the Environment.

5) Individual courses to add green collar skills and/or knowledge. For workers interested in learning about this emerging field, individual green credit and noncredit courses are available at many Connecticut postsecondary education institutions. *Community colleges in particular play an important function in availing the current workforce of green courses needed to enhance existing skill sets.* A full listing of green credit and noncredit courses offered at each of the community colleges, for example, is found in Appendix I for fall 2007 through fall 2009. Courses offered include:

- introduction to environmental science;
- environmental regulations;
- greenhouse management;
- water resources engineering;
- sustainable energy and the environment;
- principles of ecology; and
- alternative building systems.

Enrollment in the community college introduction to environmental science for-credit course has more than doubled in the past two years, from 212 students in fall 2007, to 447 students in fall 2009. While some students may be considering green certificates or degrees, it can be assumed that many of the part-time students are accessing the courses to improve or "green" current skills in the workplace.

Efforts by Connecticut's technical high schools. Preparation for green collar jobs is underway at the Connecticut technical high schools, including training on installing electricity-producing wind turbines. Recently, E.T. Grasso Technical High School in Groton graduated 13 students from its bioscience and environmental technology program, and a new facilities management program has been started at J.M. Wright Technical High School in Stamford[22]. The technical high schools are also working with the community colleges to develop career paths for related programs.

Other training efforts. As described earlier, the Connecticut Clean Energy Fund Board of Directors recently approved funding for expansion of the Learning for Clean Energy Innovation program within the Connecticut technical high school system. The program will build the capacity to train students for clean energy jobs, focusing on solar photovoltaic and solar thermal technologies, with the sharing of newly purchased equipment to be housed at three of the technical high schools (Wolcott, Grasso, and E.C. Goodwin). In addition to enabling seven high school teachers to be trained in green fields, funding has also been made available to tailor a related Massachusetts

[22] The State Department of Education recently suspended operations at the J.M. Wright Technical High School in Stamford for two years in order to study options for restructuring.

technical high school curriculum to Connecticut's needs. All electrical and plumbing students at the three schools will have this new green curriculum that will eventually be used at other technical high schools.

Besides the nonprofit public and independent institutions of higher education, there are also *for-profit institutes* that play a role in promoting and preparing the Connecticut workforce for green collar jobs. The Baran Institute of Technology (East Windsor), for example, offers an electrician certificate, diesel technology program certificate, and HVAC/Technology program certificate. Among the training offered by the Everblue Training Institute (Hartford) are LEED exam preparation and certification courses, solar training, wind training, and energy auditor training.

Other organizations that play a role in promoting and preparing Connecticut's workforce for green collar jobs are the *unions*. Several unions have apprenticeship programs in green collar fields including wire solar panels, wind turbines, and biofuel plants. For example, the International Brotherhood of Electrical Workers has developed green training curriculums in the electrical industry that range from retrofitting buildings to installing wind turbines.

Lastly, there is a national energy council that has developed uniform guidelines and best practices for training in such areas as solar photovoltaic installation, which are applicable to training in either technical high schools or colleges. The *Interstate Renewable Energy Council* (IREC) is a national nonprofit organization that develops and promotes the use of uniform guidelines, competency standards, credentialing, best practices, and quality assessment for solar and other renewable energy professionals and training programs. IREC is currently promoting use of the Institute for Sustainable Power Quality (ISPQ) framework in its guidelines.

Through the accreditation of training programs and certification of trainers, IREC ensures that a national framework of standards and metrics is adhered to, covering curriculum, training equipment, and teacher qualifications for both face-to-face and online courses. There are currently no ISPQ accredited training programs in Connecticut and no applications for ISPQ accreditation under audit.

Model for Aligning Supply and Demand for Green Collar Jobs

The Rutgers University John J. Heldrich Center for Workforce Development recently identified key elements of an effective green jobs talent network.[23] Table I-17 shows four components of an effective talent network. This model will be referred to in the following discussion of potential barriers to alignment in the green collar jobs area when applicable.

V. What are Some Possible Barriers to Alignment in the Green Collar Jobs Area?

As described in the briefing report, there are several possible barriers to the alignment of postsecondary education and employment. This section focuses on several possible barriers to alignment in the *green collar jobs area*. The barriers discussed relate to: 1) elementary and secondary school students in the knowledge/talent pipeline; 2) postsecondary education institutions;

[23] John J. Heldrich Center for Workforce Development Research Brief, "Preparing the Workforce for a "Green Jobs" Economy" by Jennifer Cleary and Allison Kopicki, February 2009.

3) difficulty in making accurate demand predictions; 4) current economic challenges; and 5) state agency organization, programs and policies. Each is now briefly discussed.

Table I-17. Model for Aligning Supply and Demand for Green Collar Jobs

1.	Identify Assets	• Create inventory of public and private assets • Identify existing training opportunities • Chart funding streams available to support green job growth and training efforts
2.	Cultivate Career Pathways	• Support low-skilled, low-income workers to move into higher-skilled jobs that pay better wages through education and green jobs training • Ensure that training results in a nationally recognized credential • Focus on accreditation of training programs and creating "stackable" credentials through articulation agreements
3.	Align Green Jobs Workforce Training Efforts with Economic Development Initiatives	• Establish a connection between attracting green energy businesses and customized training and hiring and recruitment systems
4.	Do Not Duplicate Training or Curricula	• Ensure that workers in multiple locations have access to training that is relevant to employers by developing mechanisms to share curricula that result in credentials that are in high demand by employers • Consider developing centralized training centers that provide students with the opportunity to get hands-on training using state-of-the-art equipment

Source: Rutgers University John J. Heldrich Center for Workforce Development.

Barriers related to elementary and secondary school students. *Lack of awareness or understanding of what green collar jobs are* is one possible barrier related to elementary and secondary school students, parents, teachers, and guidance counselors. Because this is an emerging field and there is no consensus on what constitutes a green job, confusion is understandable.

The U.S. Department of Labor taxonomy is a useful tool to understand the categories of occupations in a green economy (i.e., green *increased demand* occupations, green *enhanced skills* occupations, and green *new and emerging* occupations). Additionally, the categorization of green occupations into *energy efficiency* and *renewable energy* may also be useful to understanding how the various jobs fit together. Therefore, until something more definitive is provided by the U.S. DOL or Connecticut DOL, **program review committee staff recommends:**

Wherever possible, the U.S. Department of Labor taxonomy and EE/RE categorization should be incorporated into explanations of green collar jobs.

Barriers related to postsecondary education institutions. As new certificate programs are developed, it would be useful to standardize the name of identical certificate coursework across all public colleges. This will allow for articulation agreements to be more easily developed and career

ladders established. The cultivation of career pathways is one of the elements specified in the Heldrich Center model for aligning supply and demand for green collar jobs.

The standardization of new green certificate programs will also help identify education and training resources available, promoting possible opportunities to share expensive equipment needed for some green instruction. This will promote the identification of assets, another element required in the Heldrich Center model for aligning supply and demand for green collar jobs.

Currently, certificates requiring the same coursework may have different names, depending on the particular community college. To help identify the current training available and determine in the future whether more or less of such training would be needed by the Connecticut workforce, **program review committee staff recommends that:**

> **The Connecticut Community College System should implement uniform naming of green certificate programs across all member colleges.**

Because green efforts among the higher education institutions are occurring in a variety of degree and certificate programs, stand-alone courses, and centers/institutes, it is difficult to implement any of the four elements of the Heldrich Center model for aligning supply and demand for green collar jobs (i.e., identification of assets, cultivation of career pathways, alignment of green jobs workforce training efforts with economic development initiative, and not duplicating training and curricula unnecessarily). *Although CETC and the Connecticut Energy Sector Partnership are charged with developing and coordinating green collar job opportunities, they are not a central repository for the many initiatives emerging across higher education.* By regularly soliciting this information with the support of OWC staff, more comprehensive information may be made available to higher education, Connecticut DOL, and the many other members of the partnership to then share with their agencies and organizations. Efforts to align green collar jobs and employer needs may then be done more accurately and efficiently. Therefore, **program review committee staff recommends that:**

> **The Connecticut Employment and Training Commission and the Connecticut Energy Sector Partnership should regularly solicit and make widely available information on green efforts occurring among the higher education institutions including new degree and certificate programs, stand-alone courses, and center/institute initiatives useful in the alignment of green collar jobs and employer needs.**

Barriers related to difficulty in making accurate demand projections. As is apparent throughout this section, green collar jobs are just emerging and the official federal occupational code system (O*NET) has not yet caught up with these green occupations. Indeed, a recent Connecticut Department of Labor publication noted that, "Green is ubiquitous, encompassing many areas of the economy. Some occupations are 'green' one day and may be only partially green the next."[24]

[24] CT Department of Labor Economic Digest, December 2008.

Until the green field has developed further, it will be difficult to make accurate demand projections. The recently awarded ARRA grant to the eight-state consortium, as described earlier, will address some of the challenges in making projections of demands for green jobs.

Barriers related to current economic challenges. As Connecticut and the rest of the country is faced with an economic recession, *there are few resources apart from ARRA stimulus funds to purchase the expensive equipment required to train students* in such fields as solar photovoltaic and thermal installation. With some grant funding available for several of the technical high schools to purchase such expensive equipment, *the education systems need to find ways to share resources.* Thus, a technical high school with such equipment, located near a community college, should find ways to make the equipment available to both student populations. Similarly, if a college had such equipment, it could be shared with technical high schools, and also other colleges. Therefore, **program review committee staff recommends that:**

> **Educational systems should develop agreements to share equipment needed for students training for green collar jobs, such as solar photovoltaic installation.**

Additionally, *the influx of ARRA funds will not last forever, and plans should be made to continue successful initiatives beyond such temporary funding.* Entry level jobs in weatherization installation, for example, may be especially vulnerable, and career ladders and lattices should be active to train workers so they may remain employed and move into other positions. Therefore, **program review committee staff recommends that:**

> **Connecticut postsecondary education institutions and state workforce development agencies should, wherever possible, support efforts to create career ladders and lattices in the green collar fields, particularly for those workers who gained entry into the system through temporary ARRA grant opportunities.**

Barriers related to state agency organization, programs, and policies. As was described in this section, *there are multiple agencies and organizations working on efforts in the green field*. To gather information on the many disparate activities occurring, the Institute for Sustainable Energy at Eastern Connecticut State University recently attempted to identify green majors and initiatives at primarily postsecondary education institutions, the technical high school system, International Brotherhood of Electrical Workers, and private training institutes. Such an inventory would be useful in conveying what green education and training is occurring, thereby improving efficiency by reducing unnecessary duplication and sharing limited resources, including courses, certificates, majors offered, and expensive green-related equipment. The Departments of Higher Education and Education would be in a good position to obtain such information through an annual inventory. The results of the inventory would be useful for planning purposes, and made available to all postsecondary institutions and technical high schools for potential opportunities to collaborate. Therefore, **program review committee staff recommends that:**

The Departments of Higher Education and Education should prepare an annual cross-system list of green courses, and certificates and majors offered, and inventory of green-related equipment.

Multiple institutions and agencies lead to communication and coordination challenges. *Sometimes institutions are unaware of green efforts occurring within colleges in different higher education systems.* For example, during staff interviews, it was learned that representatives of the University of Connecticut (Storrs) were unaware of efforts underway at the nearby Institute for Sustainable Energy at Eastern Connecticut State University (Willimantic), and vice versa. With the University of Connecticut's recent efforts in the green field, particularly in the School of Engineering's Center for Clean Energy, human energy should be conserved, and mutually beneficial collaborations undertaken. Therefore, **program review committee staff recommends:**

Staff from both the University of Connecticut Center for Clean Energy and the Institute for Sustainable Energy at Eastern Connecticut State University should meet at least quarterly to discuss possible ways to collaborate on green initiatives. Staff from other institutions and centers located within the same regions should also form partnerships and meet to develop collaborative efforts.

Section II

STATE EFFORTS TO ADDRESS WORKFORCE SHORTAGE OF NURSES

As part of the PRI committee's study on postsecondary education and alignment with employer need, committee staff examined the strategies used to increase the number of nursing program graduates to address a serious nursing shortage that began in the late 1990s. Because the shortage had widespread public health implications and was projected to become increasingly worse, state policymakers and other stakeholders took several steps to address the issue. Many of the strategies implemented were successful and have resulted in the production of more nursing school graduates to meet employer needs. Similar strategies could be adopted for other state workforce shortage areas.

To explain the nursing shortage strategy, this section provides background information, describing nursing program enrollment, graduation, and licensure trends. It also discusses the roles of the statutorily-created Allied Health Workforce Policy Board (AHWPB) as a forum for stakeholders, building partnerships, serving as a centralized source of information regarding the various efforts, and proposing solutions on how to better align postsecondary nursing programs to produce more graduates.

Since the shortage was identified several strategies have been adopted that has increased the number of graduates of entry-level nursing programs. There were public advertising campaigns by postsecondary institutions that had nursing programs to increase awareness of nursing as a career. Scholarships and loan forgiveness programs were adopted by the legislature to encourage college students to enter nursing programs at every degree level, and to provide grants to colleges and universities to establish or expand their nursing programs. Targeted student advising, tutoring, and counseling were implemented in order to increase retention of students who were enrolled in nursing programs. Postsecondary institutions established collaborative partnerships with area hospitals that provided for hospital staff to serve as faculty for postsecondary nursing programs, offered scholarships, and provided clinical opportunities for students of nursing programs. Strategies that were implemented by one college or university were discussed by members of the AHWPB so that similar solutions could be implemented by other postsecondary institutions.

When Did Concerns Over a Shortage Begin?

Concerns over a national shortage of nurses were raised in the late 1990s and gained widespread attention over the next several years. Several reasons were cited for the nursing shortage, both nationally and in Connecticut, including: postsecondary students were no longer choosing nursing as a career and those who were had high program attrition rates; many licensed nurses only worked part-time or were working in other fields that did not involve the provision of direct client care, and the average age of licensed nurses was believed to be high (over 45 years old in Connecticut) and therefore the shortage would become increasingly worse as older nurses retired within the next decade. Current concerns regarding whether a nursing shortage still exists include the aging of the overall population and the proposed expansion of health care to the uninsured or under-insured, which would boost increase demand for nursing care.

What was Connecticut's Initial Response to the Nursing Shortage

Nursing shortage study. One of the first responses by the Connecticut General Assembly in responding to the potential crisis was the adoption of P.A. 00-216, which mandated the Department of Public Health commissioner to conduct a study concerning the state's shortage of nurses.[25] The study was to include an examination of the causes for the shortage of nurses in the state and recommendations to address the shortages. The legislation also required the study to examine the establishment of a uniform method to capture actual nurse-to-patient ratios in hospitals, long-term care facilities, and home health agencies, and make recommendations for supplementing nursing care in the state in response to the nursing shortage.

The 2000 report, issued by *The Healthcare Decision Group*, noted that the "field of nursing has experienced recurrent cyclical shortages and surpluses over the past decades; fewer than ten years ago the supply of nurses was considered abundant, many institutions reduced their nursing work force by downsizing administrative nursing staff, and registered nurses were employed in positions formerly filled by licensed practical nurses (LPNs). Factors influencing the oversupply and staff reductions included the high unemployment rate within the country, reduced hospital stays, and the focus on cost containment within the healthcare system (e.g. managed care)."[26]

At the time of the shortage, the study cited the poor quality of available state data but using existing national and state survey information estimated the average age of RNs in Connecticut to be 46.5 years old with 60 percent of licensed RNs working full time; 23 percent part time; and 17 percent maintaining their license but not working in the nursing profession.

Study findings and recommendations. The study recommended that short- and long-term strategies be implemented, monitored and adjusted according to market demand. They identified the types of economic incentives that were considered to attract and retain nurses in direct patient care settings, including tuition reimbursement programs, loan forgiveness, scholarship opportunities, child care incentives, and tax relief programs.

The report concluded that the shortage Connecticut was experiencing resulted from a large numbers of licensed nurses not working in the nursing profession; the state had a sufficient number of licensed nurses to meet the healthcare needs of its population. It recommended both efforts aimed at getting nurses to stay in or re-enter the nursing profession, and increasing the number of graduates to replace nurses leaving the workforce.

What is the Current Supply of Licensed Nurses?

Department of Public Health. According to the Department of Public Health, there were 53,476 licensed RNs and 12,293 LPNs in Connecticut as of April 2009. At the time of the PRI review, demographic information on Connecticut's licensed nurses, such as average age or working status, was not available because information submitted on licensing applications was not

[25] Funding of $250,000 was appropriated to support the costs of conducting a study of the nursing shortage.
[26] *Study Concerning the Shortage of Nurses and the Quality of Patient Care in Connecticut*, The Healthcare Decisions Group, Washington, D.C., December 2000.

electronically stored or manually compiled. Although DPH anticipates beginning an online licensure renewal option for nurses that will capture some demographic information by the end of 2009, the department acknowledged that nurses will still be able to renew by submitting a mail-in form and, for these nurses, information will not be electronically captured.

Department of Labor. The Connecticut Department of Labor examines employment by occupation and projects future need. Table II-1 shows the number of nurses actually employed, ten-year projections of demand, net job growth, and total projected annual openings for RNs in Connecticut. In 2006, DOL estimated that 32,840 RNs were employed, much less than the 52,326 RNs reported by DPH to be licensed in 2006.

Table II-1. DOL Employment Projections for Registered Nurses 2000-2006

Base Year	*Employment*		*Projected Job Growth*		*Total Estimated Average Annual Openings*
	Actual Employment	*10-year Projection*	*Net Job Growth*	*Percent Change*	
2000	30,560	36,740	6,180	20.0	1,235
2002	31,360	36,610	5,250	16.7	1,181
2004	31,890	36,020	4,130	13.0	1,081
2006	32,840	38,560	5,720	17.4	1,114

Source: OLR Memo 2008-R-0444 (based on DOL "Connecticut's Industries & Occupations Forecast: 2003, 2005, and 2006)." Updated by PRI using DOL "2008 projections Forecast for 2006- 2016"

The table shows that from 2000 to 2004, there were over 1,000 job openings projected annually for RNs even though 10-year job growth projections decreased each year. By 2006 however, both job openings and growth projections were expected to increase, with DOL projecting a 17.4 percent increase in employment from 2006 to 2016, and 1,114 estimated annual openings, on average, for RNs over the 10 years projected. The total number of annual openings shown in the last column in the table takes into consideration death and retirement rates.

The department also does similar projections for licensed practical nurses. Table II-2 shows there were 8,020 LPNs employed in 2006 and 9,070 job openings projected by 2016, an overall increase of 13 percent. When death and retirement are considered, DOL projected there would be 324 annual openings, on average, per year.

Table II-2. DOL Employment Projections for Licensed Nurses 2000-2006

Base Year	*Employment*		*Projected Job Growth*		*Total Estimated Annual Openings*
	Actual Employment	*10-year Projection*	*Net Job Growth*	*Percent Change*	
2000	7,010	7,990	980	14.0%	278
2002	7,400	7,900	500	6.8%	208
2004	7,880	9,100	1,220	15.5%	294
2006	8,020	9,070	1,050	13.1%	324

Source: DOL "Connecticut's Industries & Occupations Forecast: 2003, 2005, and 2006"

Because of data limitations, many factors that influence the current and future supply of nurses - the age of nurses, the number that work full- or part-time, the types of workplace settings in which nurses are employed, and the number providing direct patient care or employed by other industries, such as insurance - make determining the adequacy of supply problematic.

What Types of Postsecondary Nursing Programs Are There in Connecticut?

Types of RN nursing programs offered at Connecticut's colleges and universities. Connecticut statute (C.G.S. Sec. 20-87a) states the "practice of nursing by a registered nurse is defined as the process of diagnosing human responses to actual or potential health problems, providing supportive and restorative care, health counseling and teaching, case finding and referral, collaborating in the implementation of the total health care regimen and executing the medical regimen under the direction of a licensed physician, dentist or advanced practice registered nurse." Seventeen colleges and universities in Connecticut offer nursing programs (see Table II-3). There are five types of educational paths to becoming a registered nurse and include:

- A diploma program offered by Bridgeport hospital
- two year associate of science degrees in nursing;
- four year bachelor's of science degrees in nursing;
- Accelerated career entry programs leading to a BSN for individuals already having a bachelor's degree in a non-nursing field; and
- A master of science in Nursing (MbEIN) for individuals without a bachelor's degree in nursing.

There are also programs that allow individuals who are already licensed as an RN with a diploma or associate degree to enter programs to earn a bachelor's degree in nursing, as well as master and doctorate programs. It is important to note that most of the master's degree programs are for individuals who already are licensed RNs and are earning advanced practice or specialty degrees, although some institutions now have an education focus for students who may want to become faculty. In addition to the RN programs identified in the table, LPN programs are offered by the technical high schools (in the adult division) and three proprietary schools and are described later in this section.

Table II-3. Connecticut Postsecondary Schools with Nursing Degrees

College or University	*Town*	*Program*	*Degree Level*
Public Colleges and Universities			
Capital Community College	Hartford	Nursing	Associate of Science
Gateway Community College	New Haven	Nursing	Associate of Science
Bridgeport Hospital School of Nursing - graduates can enroll at Housatonic Community College	Bridgeport	Nursing Nursing	RN Diploma program Associate of Science
Naugatuck Valley Community College	Waterbury	Nursing	Associate of Science
Norwalk Community College	Norwalk	Nursing	Associate of Science

Table II-3. Connecticut Postsecondary Schools with Nursing Degrees			
College or University	***Town***	***Program***	***Degree Level***
Three Rivers Community College	Norwich	Nursing	Associate of Science
Central Connecticut State University	New Britain	Nursing (RN to BSN)	Bachelor of Science in Nursing
		Nursing	Bachelor of Science in Nursing
		Nursing	Master of Science (Biological Sciences: Nurse Anesthesia)
Southern Connecticut State University	New Haven	Nursing	Bachelor of Science in Nursing
		Nursing (RN to BSN)	Bachelor of Science in Nursing
		Nursing (accelerated career entry program)	BSN
		Nursing	Master of Science in Nursing – Clinical Nurse Leader Family Nurse Practitioner
		Nurse Practitioner	Graduate Certificate
Western Connecticut State University	Danbury	Nursing	Bachelor of Science
		Adult Nurse Practitioner	Master of Science in Nursing
		Nursing	Master of Science in nursing
		Post-Master's Adult Nurse Practitioner	Certificate of Advanced Studies
University of Connecticut	Stamford	Master's Entry into Nursing (MbEIN)	Graduate Certificate
	Storrs	Nursing	
		Nursing	
		Nursing	
		Master's Entry into Nursing (MbEIN)	Graduate Certificate
		Nursing Practice	Doctor of Nursing Practice
	Waterbury	Master's Entry into Nursing (MbEIN)	Master of Science in Nursing
	West Hartford	Nursing	Master of Science in Nursing
Independent Colleges and Universities			
Fairfield University	Fairfield	Nursing	Bachelor of Science in Nursing
		Nursing (RN to BSN)	Bachelor of Science in Nursing
		Nursing (accelerated career entry program)	Bachelor of Science in Nursing
		Advanced Practice Nursing	Master of Science in Nursing
Goodwin College	East Hartford	Nursing	Associate of Science
		Nursing (RN to BSN)	Bachelor of Science in Nursing
Quinnipiac University	Hamden	Nursing	Bachelor of Science in Nursing
		Nursing (accelerated career entry program)	
		Nursing	Master of Science in Nursing
		Nursing: Adult Nurse Practitioner	Master of Science in Nursing
		Nursing: Family Nurse Practitioner	Master of Science in Nursing
		Nursing: Forensic Nursing Clinical Specialist	Master of Science in Nursing
		Nursing (RN to BSN)	Bachelor of Science

Table II-3. Connecticut Postsecondary Schools with Nursing Degrees			
College or University	***Town***	***Program***	***Degree Level***
Sacred Heart University	Fairfield	Nursing	Bachelor of Science
		Patient Care Services Administration	Master of Science in Nursing
		Family Nurse Practitioner	Master of Science in Nursing
		Clinical Nurse Leader	Master of Science in Nursing
		Family Nurse Practitioner	Sixth Year Certificate
St. Joseph College	West Hartford	Nursing	Bachelor of Science
		Nursing	Master of Science
St. Vincent's College	Bridgeport	Nursing	Associate of Science
University of Hartford	West Hartford	Nursing (RN to BSN)	Bachelor of Science in Nursing
		Nursing & Organizational Behavior	Master of Science in Nursing (concentrations: teaching, management, community/public health
Yale University	New Haven	Nursing	Master of Science in Nursing
		Nursing	Sixth Year Certificate
		Nursing	Doctor of Philosophy

[1] Charter Oak State College offers an on-line LPN to RN Bridge course and an RN refresher course for RNs returning to the field, and an on-line perioperative nursing course to maintain a pool of qualified operating room nurses.

Source: Office of Legislative Research Report 2008-R-044 (updated by PRI staff).

What are the Trends in Nursing Programs?

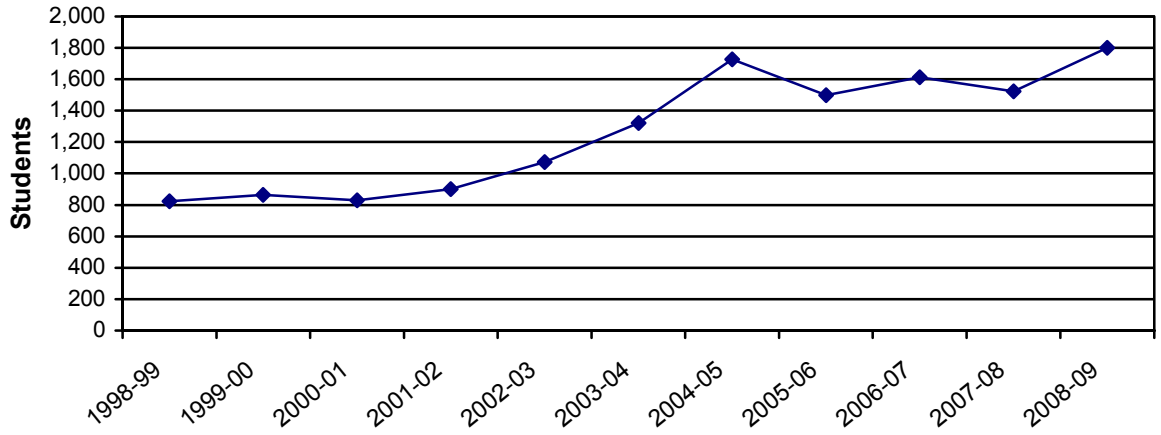
Program review committee staff reviewed a variety of trends related to postsecondary nursing programs in Connecticut to examine how the supply of students enrolled in entry-level RN nursing programs has changed since the shortage was first identified.

Trends in admission to nursing programs. Colleges and universities in the state have begun new or expanded their nursing programs to be able to enroll more students, although in interviews with PRI staff, many nursing program representatives indicated that many qualified students are still being denied admission because of limited program capacity. Based on the most recent data from the Connecticut Board of Nursing Examiners, 90 more students could have been accepted to entry-level RN nursing programs if additional capacity existed. Figure II-1 shows the number of admissions to nursing programs leading to RN licensure since the 1998-1999 academic year. Admissions for 2008-2009 had the greatest number of students over the 10 years examined, with 1,801 students admitted.

Attrition trends. The retention of students in nursing programs has important implications for the future supply of nurses. Figure II-2 shows program attrition rates for nursing programs that lead to RN licensure. The highest attrition rates were from 1998-99 to 2001-02. Even in the 2007-08 academic year, attrition was 11.6 percent. The school with the lowest attrition rate in 2007-08 was the University of Connecticut (.965 percent) and the highest was Capital Community College (28.1 percent). Despite increasing the number of students admitted to nursing programs, the attrition rates

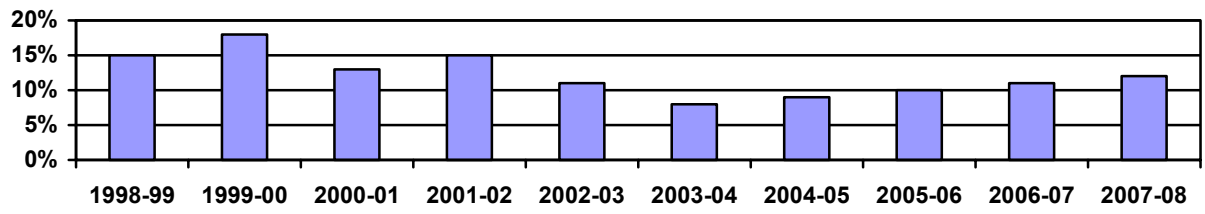
overall have remained below 15 percent, although it has increased since the 2003-2004 academic year.

Figure II-1. Admissions to Entry-Level RN Postsecondary Programs



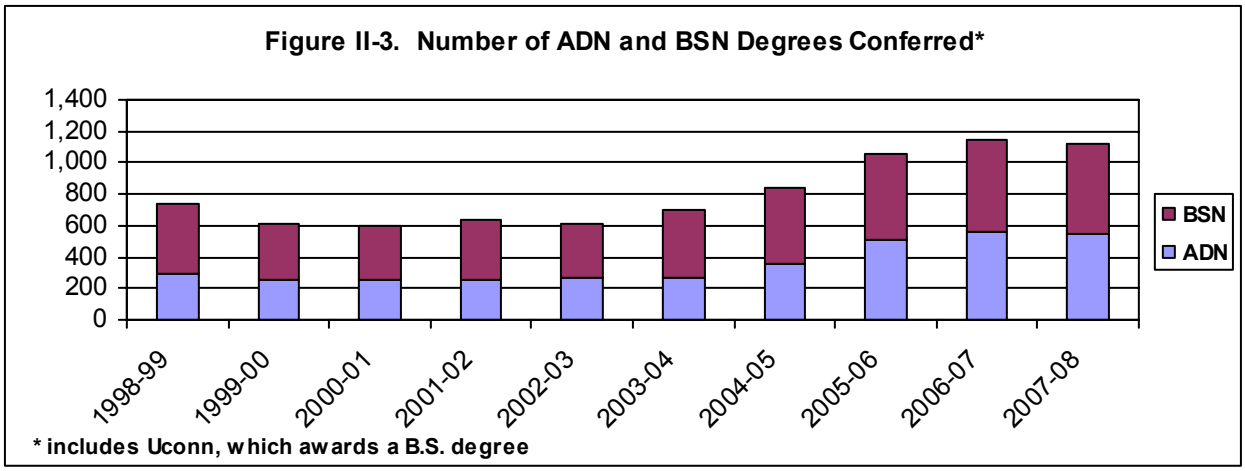
Source: Connecticut Board of Examiners for Nursing

Figure II-2. Nursing Program Attrition Rates (for programs leading to eligibility for RN licensure)



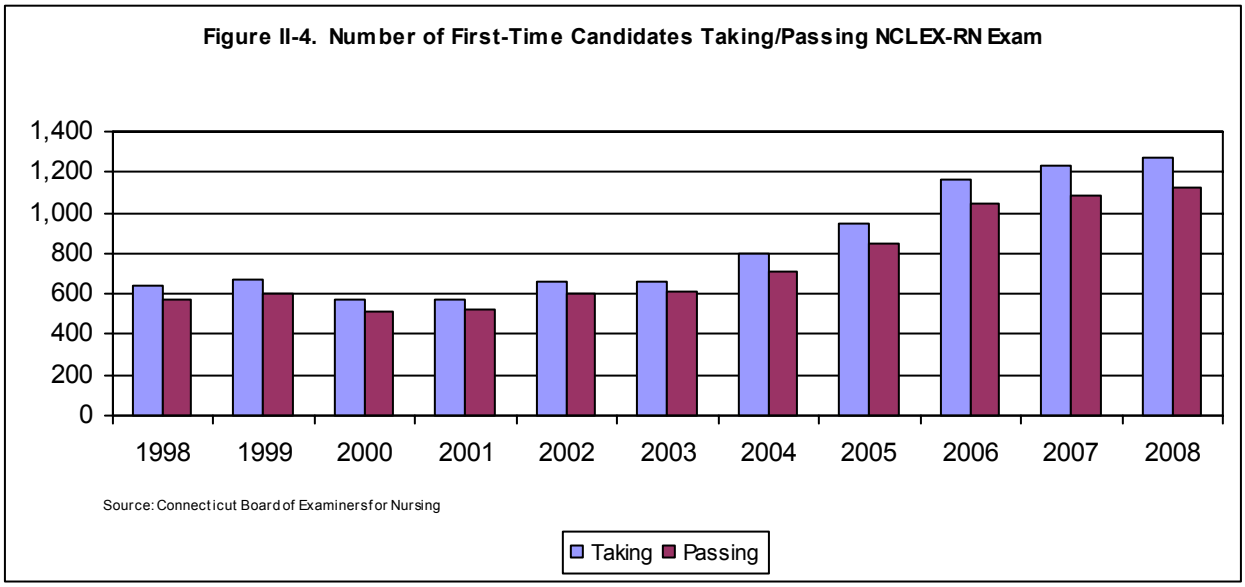
Source: CT Board of Examiners for Nursing

Trends in degree completion. Figure II-3 shows the number of nursing program graduates beginning in the 1998-1999 academic year. As the figure shows, the number of graduates decreased from 737 graduates in 1998-99 to 594 in 2000-2001, but then increased substantially since 2003-04. The number of bachelor's of science nursing degrees outpaced the number of associate of science nursing degrees conferred in each year shown, even though the greatest increase is from students earning an associate's degree in nursing (88 percent) versus graduates of bachelor's of science nursing programs (29 percent). Overall, there were 524 more degrees conferred in 2007-08 than in 2000-01, the low point over the ten years examined. The greater number of degrees completed is a result of the increasing number of students admitted to nursing programs attrition rates slightly decreasing.



Passage of NCLEX-RN exam. Each state requires a candidate for RN and LPN licensure to pass an examination that measures the competencies needed to perform safely and effectively as a newly licensed, entry-level nurse. The National Council of State Boards of Nursing (NCSBN) developed two licensure examinations, the National Council Licensure Examination for Registered Nurses (NCLEX-RN), and the National Council Licensure Examination for Practical Nurses (NCLEX-PN) for those seeking to be licensed as LPNs. Both exams are used by states' boards of nursing to assist in making licensure decisions.

Program review committee staff examined the number of individuals that sat for the NCLEX-RN exam and the pass rate. Figure II-4 shows that 642 candidates took the exam for the first time in 1998 and 1,274 in 2008, an increase of 98.4 percent. The pass rates have been fairly consistent over the time period examined, with about eighty-eight percent of first-time candidates passing it. In 2000, only 512 individuals passed the exam and by 2008, 1,122 individuals passed it, an increase of 119 percent.



Career ladders for RNs. Building the talent pipeline involves establishing career ladders that provide for a progression from entry level positions to higher levels that will provide increased pay, skills, or responsibilities. Six colleges and universities in the state offer RNs, who hold either a diploma from a hospital-based program or an associate's degree in nursing, the opportunity to receive their bachelor's of science in nursing, while providing credit for work already undertaken at a lower level through articulation and other transfer agreements. A few schools offer accelerated entry programs that allow individuals who hold a bachelor's degree in a non-nursing field to complete a bachelor's or master's nursing degree at an accelerated pace. Data from the Connecticut Board of Examiners show that 76 students who already were licensed as RNs enrolled in baccalaureate programs in nursing in the 2008-09 academic year.

Masters and doctorate nursing program enrollment. Ten colleges and universities offer nursing-related degrees at the masters or doctorate level. One of the concerns regarding the shortage of nurses is that there are a low number of candidates seeking masters and doctorate degrees, because faculty need to have a master's degree to teach undergraduate students and a doctoral degree to teach graduate students in specialty nursing programs.

A study that was completed for the Allied Health Workforce Policy Board in January 2007 noted that the number of full-time nursing faculty across all schools and programs was about 184 in 2005; 18 percent of these faculty indicated that they planned on retiring in 2008. The report recommended a program be adopted to proactively produce replacement faculty. In addition, the report recommended that instead of greatly expanding Connecticut nursing programs, efforts should focus on increasing student retention rates. The report noted that improving attrition rates would allow for existing resources to be used more efficiently by increasing graduates, rather than adding additional capacity but yet still resulting in the same number of graduates because of poor attrition. In interviews with officials from public higher education nursing programs, PRI staff were told that public institutions have lost additional nursing faculty under the state's recent early retirement program.

Number of master's and doctorate degrees. Figure II-5 shows trends in the number of degrees conferred for master or doctorate degrees. There has been a 26 percent increase in the number of students obtaining graduate degrees over the ten-year period examined. However, many graduates completing advanced degrees will enter advanced practice specialties and do not plan on teaching. Furthermore, according to interviews conducted by PRI staff, faculty salaries contribute to the lack of individuals being attracted to teaching. Wage statistics maintained by the Connecticut Department of Labor indicate the average salary of a RN in 2008 with an associate's degree is $71,699 while postsecondary nursing instructors and teachers average salary is $76,856.

Licensed Practical Nurse Programs

To apply for licensure in Connecticut as an LPN, an individual must complete a nursing program that is at least 12 months long with a minimum of 1,500 hours (50 percent of which must encompass clinical or observational care experiences), apply to the Department of Public Health, and pass a national exam. LPNs must work under the direction of a registered nurse or an advanced

practice registered nurse, or for LPNs employed by home health agencies, under the direction of a physician licensed in Connecticut.

Figure II-5. Number of Master and Doctorate Nursing Degrees Conferred

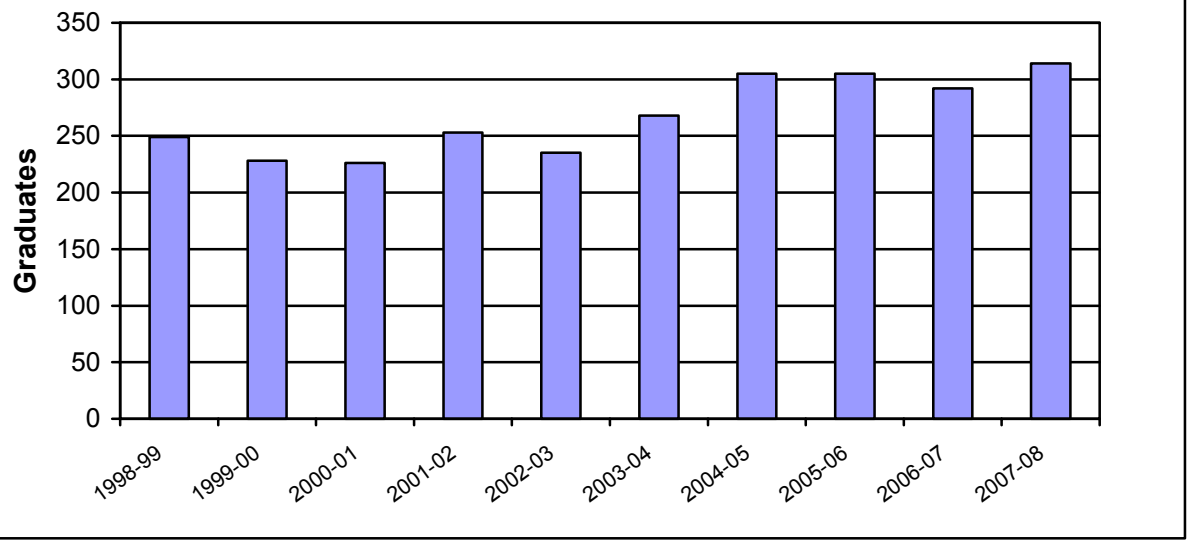


Table II-4 shows the ten of the Connecticut Technical High Schools (Adult Education Division) and three private occupational schools offer licensed practical nurse programs.[27] To be eligible for admission, the individual must have either a high school degree or have passed the General Education Development exam (GED), as well as pass an entrance exam. The length of the program differs. The technical schools offer full-time 16-month programs that can be completed in three semesters and part-time in two years, while programs offered by private occupational schools take anywhere from 15 months or longer to complete. Once the program is successfully completed, a graduate is eligible to sit for the national licensing examination (NCLEX-PN). According to wage statistics maintained by the Connecticut Department of Labor, the average salary of a LPN is $52,773.

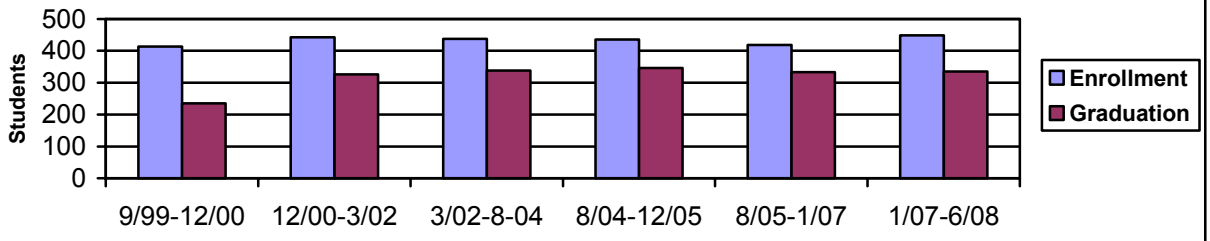
LPN enrollment and graduation trends. LPN program capacity at the technical high schools has not increased nearly as much as the RN programs (the increase has come from the growth in programs offered by proprietary schools). The number of students enrolling in and graduating from LPN programs offered by the technical high schools is shown in Figure II-6. The number of students enrolled in a LPN program grew from 413 students admitted into the September 1999 class to 449 students admitted into the August 2008 class, an increase of only 9 percent. In comparison, the number of students enrolling in entry-level RN programs increased by 936 students over the same time period.

[27] On December 1, 2009, in a deficit mitigation plan, Governor Jodi Rell proposed suspending the adult education program for licensed practical nurses offered at the technical high schools to achieve savings of $1.7 million. The governor has the authority to make the cut and does not need legislative approval. Students currently enrolled in these programs will be allowed to finish (students in all but two of the programs are scheduled to graduate in December 2009.

Table II-4. Licensed Practical Nurse Programs		
Technical High Schools	***Location***	***8/2008 – 10/2009 Enrollment***
Public		
A.I. Prince	Hartford	40
Bullard- Havens	Bridgeport	31
E.C. Goodwin	New Britain	40
Eli Whitney	Hamden	40
Henry Abbot[1]	Danbury	30 (FT) 15 (PT)
W.F. Kaynor	Waterbury	40
Norwich	Norwich	40
Vinal[1]	Middletown	30 (FT) 27 (PT)
Windham	Willimantic	30
Private (Occupational Schools)		
Lincoln Technical Institute	Hamden New Britain Shelton	n/a
Porter and Chester Institute	Enfield Rocky Hill Watertown	n/a
Stone Academy	East Hartford Hamden	n/a

[1] Evening program available
n/a: enrollment information was not available, but the number of candidates sitting for the national exam is shown by public versus private schools in Figure II-2.
Charter Oak State College also offers an on-line LPN refresher course.
Source: SDE/Technical High Schools Website.

Figure II-6. LPN Enrollment In and Graduation From Technical High Schools

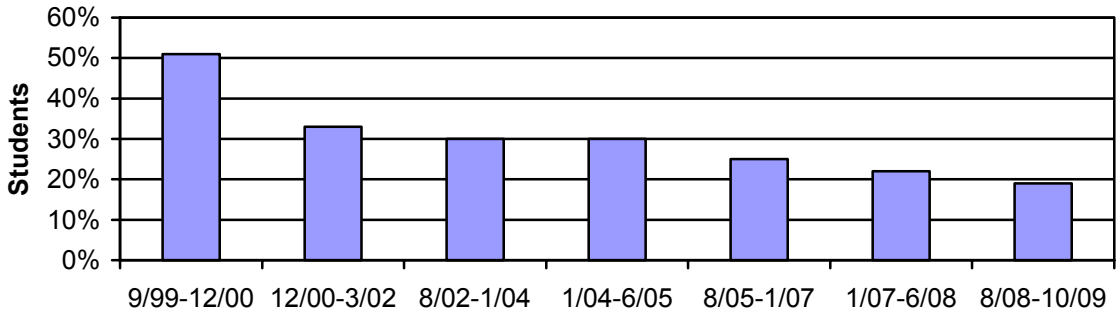


Source: Connecticut Technical High Schools

Attrition rates in public LPN programs. Attrition rates in the technical high school LPN programs have been very high even though they have improved significantly over the years (Figure

II-7). In the 1999 entering class, the attrition rate was 51 percent and the 2008 entering class was the first that had attrition rates below 20 percent in all of the years examined. Data provided by the technical high schools shows that of the 79 students leaving the program in the 2008 class, 63 left for personal reasons, 12 because they failed theory coursework, 2 for clinical failure, and 5 because of high absenteeism. In the 1999 entering class, of the 210 students that left the programs, 123 left for person reasons, 49 because they failed theory coursework, 23 for clinical failure, and 15 because of absenteeism.

Figure II-7. LPN Attrition Rate in Technical High School LPN Programs



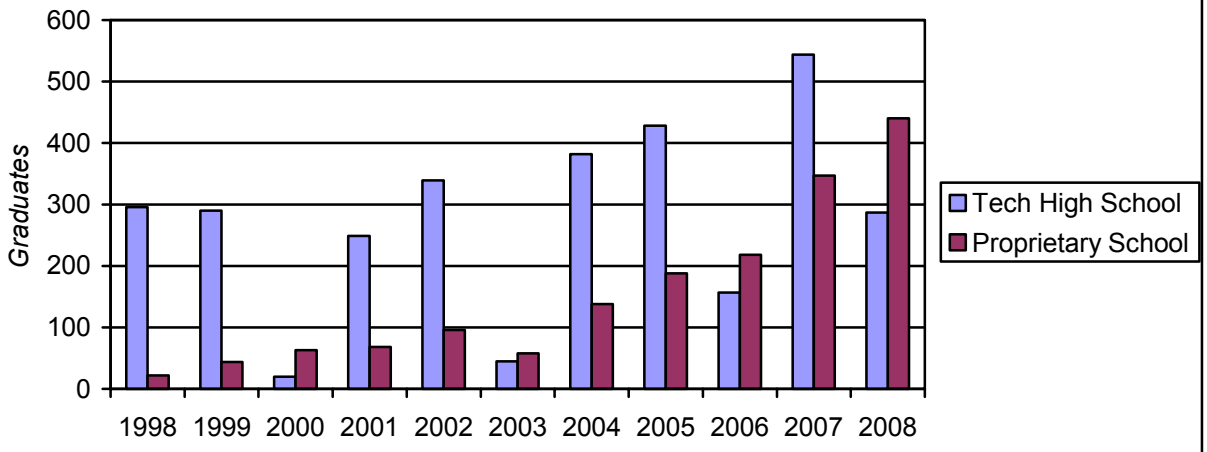
Source: Connecticut Technical High Schools

Passage of NCLEX-PN exam. In addition to the LPN program offered by the technical high school system, three proprietary schools also have program in multiple locations. They are:

- Lincoln Technical Institute in New Britain, Hamden, and Shelton;
- Stone Academy in East Hartford and Hamden; and
- Porter & Chester Institute in Watertown.

Program review committee staff examined the number of individuals passing the NCLEX-PN, shown in Figure II-8 for both technical high school and proprietary school graduates. In 1998, there were 318 individuals who passed the exam, all but two of them having graduated from the technical high school. By 2008, a total of 727 graduates passed the exam, 61 percent of those graduating from a proprietary school. The number of graduates from proprietary school programs exceeded those from the technical school program in 2206 and 2008. Some years (2000, 2003, 2006, and 2008) show a lesser number of individuals passing the exam from the technical schools because of the 16-month cycle for their full-time program, and therefore the statistics reflect that there are not program graduates each year from the technical high school programs.

Figure II-8. Number of Candidates Passing NCLEX-PN Examination



Source Connecticut Board of Examiners for Nursing

Career ladders for LPNs. One way to build the talent pipeline is to encourage individuals to progress from one career level to the next. Charter Oak State College received a grant to study the LPN program offered by Connecticut's technical high schools in 2007. It recommended a number of changes be made including ways to create career ladders for individuals licensed as LPNs who want to become RNs.

As a result of the study, the technical school system aligned its LPN curriculum to meet the prerequisite requirements of the registered nurse programs offered at the state's community colleges beginning with the fall 2008 class. In order to receive college credit and be accepted into a community college nursing program, technical school graduates must apply to Charter Oak State College and complete an on-line LPN-RN bridge class.

Data shows that 34 individuals who already are licensed as LPNs were admitted to postsecondary registered nurse programs for the 2008-2009 academic year, slightly less than 2 percent of the 1,801 total students admitted.

State Strategies to Address the Nursing Shortage

Several strategies were adopted in Connecticut in reaction to the impending nursing shortage predicted in the 1990s, and the response involved both public and private entities. Active participants in developing solutions to the potential public health crisis included the executive and legislative branches of government, the education and higher education departments, the four higher education constituent units (acting in concert or independently), independent colleges and universities, and the state's hospitals and other health care institutions.

Key factors contributing to the success of attracting more students to enroll in and graduate from the state's nursing programs, as shown in the trend data above, were: the creation of the Allied Health Workforce Policy Board (discussed below); the aggressive pursuit of federal, state, and private funding by colleges and universities, both collectively and individually, to provide tuition

assistance; student advising; targeted student tutoring; the initiation of new and expansion of exiting nursing programs; and the collaborative partnerships developed between the nursing programs, hospitals, and other health care institutions/associations in the state.

Below are examples of some of the strategies that were implemented. The examples are grouped by ways in which certain strategies have been adopted and implemented in order to overcome the five barriers identified in Section VI of the PRI staff briefing report.

Barrier 1: Related to Elementary and Secondary School Students. It has been well documented that students entering higher education are often unprepared and lack the reading and math skills that are necessary for successful completion of college coursework. This is particularly true for students who want to enter nursing programs, where admission is very competitive and there are numerous math and science prerequisites. Many of the initiatives that were undertaken to attract students to nursing (and other allied health) careers and prepare for entrance into college programs addressed the elementary and middle school levels.

Examples of some of the strategies used are intended to increase awareness, better prepare, or create career paths from high school to careers in nursing (and other allied health fields) at the high school level include:

- UConn Health Center and its four Area Health Education Centers conduct career days and other career programs at the high school level to introduce students to the types of health care careers available.

- Health Careers Pathways Certificate program (discussed below), offered by the community college system, is integrated into high school counseling so that students are aware of the program and the opportunities available in the nursing and allied health care field.

- Dual Enrollment Initiative, led by the community college system, allows high school students to take credit courses in math, science and technology in their junior and senior years of high school at the community colleges and receive college credit.

- UConn School of Nursing has partnered with Harford Public High School Nursing Academy to increase interest in the nursing field and attract minority students.

- The Office of Workforce Competitiveness, the technical high school system, and the community college system provide high school students with planned coursework which allows articulation into the community college system for a certificate or associate degree in an allied health discipline.

- Connecticut Career Choices Program, facilitated by OWC, promotes curriculum to provide the math and science skills necessary for students interested in technology and nursing careers. Efforts are being made to align this curriculum with the Health Career Pathways Certificate program at the community college system (funding eliminated in the 2009 – 2011 biennium budget).

Barrier 2: Related to Postsecondary Education Institutions. Some of the barriers to alignment include the multiple goals of colleges and their conflicting viewpoints on whether they are preparing generalists or specialists. Further, community college graduation rates continue to remain lower than expected, despite a sizable percent of students hoping to attain their associate degree.

Attrition rates. One reason that attrition rates in community college nursing programs are lower than those for their general education programs is because the nursing programs have selective, competitive admission policies (i.e., not all who apply are admitted). In addition, several prerequisites must be completed before a student can even be considered for admission to the program. Thus, students may be better prepared than those in general education programs, as evidenced by the higher retention rates among community college students enrolled in nursing programs.

However, compared to other nursing programs in the state, four of the five community college programs had the highest attrition rates, with Capital Community College at 28 percent for the 2007 academic year, followed by Gateway (17.6 percent), Norwalk (16.1 percent), and Naugatuck Valley (11.4 percent). The Bridgeport Hospital's RN diploma program and Three Rivers Community College tied, with an attrition rate of 10.4 percent.

Efforts to improve attrition rates. In 2005, the Connecticut Community College System received two U.S. Department of Labor grants that focused on attracting and supporting careers in allied health fields. The grants provided for a number of strategies designed to attract more individuals to nursing and other allied health careers and additional supports to students enrolled in these types of programs. Both grants include a joint initiative with the Workforce Investment Boards that have staff who have been trained as Health Care Advisors to assist in counseling individuals about the allied health career opportunities offered through the community college system.

The first grant, funded November 2005 to October 2008, was $2.1 million. The purpose of "The Career Pathways Initiative in Nursing and Allied Health" was to produce a higher rate and number of graduates in nursing and allied health by increasing instructional supports, enhancing curriculum targeting, and providing academic and career counseling. This grant received a no-cost extension and runs until December 31, 2009.

The second grant is funded from January 2007 to December 2009, and also is for $2.1 million. Called "The Bridges to Health Career Initiatives," it was focused on students who were receiving developmental education or enrolled in non-credit programs. Grant funds allow for targeted advising so that students could successfully transition into credit certificate programs or associate degrees.

The Health Career Pathways Certificate program, referenced above, was developed under the Bridges to Health Career Initiatives grant and is designed to assist with the coursework necessary to apply to other health care programs, such as nursing. Credits from this program may be applied toward health care programs requirements within the community college system.

Connecticut Workforce Investment Strategies for Healthcare (WISH application). Since the two grants discussed above end in December 2009, the Office of Workforce Competitiveness submitted a new grant application in October for $5 million in federal stimulus funding to expand the state's health care workforce. Called Connecticut Workforce Investment Strategies in Healthcare (WISH), the state would use the funding to provide scholarships and affordable education and to support reeducation for unemployed individuals or those in low-income jobs who are interested in pursuing nursing or other health-related careers. Specifically, $900,000 of the grant would be expected to go toward the provision of scholarships and financial support for students pursuing health care careers. The intent of applying for the grant is to build on the successful collaboration that has been established under the two previous grants received by the community college systems and maintain Health Career Advisors in each of the five WIBs.

Other initiatives to grow the nursing pipeline. Public and private postsecondary institutions with nursing programs undertook many initiatives designed to provide student supports, expand programs, and partner with hospitals, the major employers concerned with ensuring the pipeline of nurses continued to expand. Examples of some of the strategies adopted include:

- increasing opportunities for career mobility through the use of articulation agreements for all levels of nursing (LPN to RN, RN to BSN, RN to MSN);

- establishing and expanding accelerated BSN or MbEIN programs for individuals with a bachelor's degree in a non-nursing field seeking a nursing degree;

- expanding program enrollment, particularly at the community college and associate degree level;

- initiating the Connecticut Community College Nursing Program (CT-CCNP), which is a system-wide approach to nursing admissions, curriculum, and testing. It allows students to complete a standard nursing admissions process for any one of the five colleges and seamlessly transfer among the colleges;

- establishing new degree programs at the aster's and doctorate levels;

- forging partnerships with area hospitals to increase clinical placements, offer students hospital-funded scholarships, and/or develop visiting-faculty arrangements with master's-prepared hospital-based nursing; and

- pursuing funds to make scholarships available to all nursing students from RN through doctorate programs.

Noted above is just a sampling of some of the activities that have occurred to grow the nursing pipeline in the state. In addition to formal system-wide programs, individual colleges and universities that operate nursing programs also have their own initiatives and policies aimed at recruitment and retention.

Barrier 3: Difficulty in Making Accurate Demand Projections. Limited information is available on the accuracy of the DOL job demand projections. DOL staff do not look back to determine whether previous projections made for future years were accurate in terms of the number of job openings that were available when that year arrived. Committee staff also noted in the staff briefing report that there may be a lack of awareness of the DOL projections and questioned whether the projections were actually being used by college administrators, faculty and students.

PRI staff assessed the accuracy of projections made in 1998 for the year 2008 (projections are made for 10 years out) in the briefing report and found the number of openings for registered nurse projected and actually employed was very accurate. Only two percent more RNs were employed than had been projected as being needed. Similar projections by DOL for LPNs, however were fairly inaccurate: DOL projected 17 percent more openings for LPNs than were actually employed.

Program review committee staff found that, contrary to higher education institutions and other organizations, the Allied Health Workforce Policy Board relied on projections made by DOL, along with other data such as the nurse vacancy surveys done annually by the Connecticut Hospital Association, to support its own recommendations from year-to-year.

Furthermore, concerned about the lack of data available quantifying the number of nursing and other allied health faculty available to educate students seeking admission to such programs, the AHWPB recommended two studies be undertaken. The Office of Workforce Competitiveness commissioned a Nursing and Allied Health Faculty Staffing Plan, which was completed in January 2007. The study examined the faculty necessary to meet current and projected labor market training needs in all allied health areas for both public and private higher education institutions and outlined the current and projected resources for allied health programs to meet workforce shortages. It contained several recommendations that have been incorporated into proposals put forth by the AHWPB.

The other AHWPB study concerned clinical placement capacity and was completed by the CHA in July 2007. The report, "Clinical Placement Capacity Assessment Project Report" determined the current status of Connecticut's clinical placement capacity for nursing and certain allied health students to complete the required clinical components of their programs.

As noted above, there is no demographic data available on Connecticut's licensed nurses. Some of these concerns may be alleviated when DPH rolls out its on-line license renewal system for nurses, which is anticipated by the end of this year. However, as noted above, mail-in renewal is still possible and demographic information for nurses who choose this method will not be electronically captured or compiled. Given that there is a greater than 20,000 nurse discrepancy that exists between the number of licensed nurses in the state (captured by DPH) and the number that are employed (captured by DOL), it is clear better data will still need to be developed in order to determine the adequacy of supply.

Authors of a recent article in *Health Affairs, The Policy Journal of the Health Sphere*, noted the recent increase in employment and the increase in the number of students entering and

graduating from nursing programs has improved projections of the future supply of RNs, but still projected a shortage in the future because of the rapidly aging workforce.[28]

The 2009 AHWPB report notes that the state appears to be producing an adequate supply of LPNs. Comparing Connecticut DOL projections on the number of annual openings for nurses for the 2006 to 2016 years to the number of individuals taking the NCLEX-RN appears that supply and demand are equal and that there is an oversupply of LPNs. However, there are many unknowns in the future, especially regarding the expansion of health care. In addition, a recent study found baby boomers are facing higher disability rates as they age than the previous generation, which will increase demand for nurses.[29]

To further call into question whether or not the demand for nurses has reached a saturation point, results of a recent survey by the Connecticut Conference of Independent Colleges found anywhere from 65 percent to 100 percent of graduates of RN nursing programs were employed within six months of graduation.

Barrier 4: Current Economic Challenges. A significant factor impacting the job projections both at the state and national level are current economic conditions, such as the recent recession. The literature reviewed indicates that nursing shortages are cyclical and during times of high unemployment, nurse supply is not as low as in better economic times. These studies have shown that more nurses work in direct care, full-time, and re-enter the workforce during economic lows. In addition, nurse demand may be lower during economic downturns because individuals who become unemployed often lose their health care and may put off elective surgery.

Barrier 5: Related to State Agency Organization, Programs, and Policies. As noted in the staff briefing report, Connecticut's system of public higher education is very decentralized. As a result, decisions are often made from the bottom up – at the individual college or constituent level, rather than in a centralized manner that makes strategies uniform across all colleges.

Recognizing the need to bring together a working group of individuals focused on increasing the number of nurses, the legislature created the Allied Health Workforce Policy Board under P.A. 04-220 (codified as C.G.S. Sec. 4-124dd). The board is charged with conducting research and planning activities related to the allied health workforce.[30] Its eight statutory responsibilities are:

[28] Dr. Peter Buerhaus, Health Affairs, The Policy Journal of the Health Sphere, Surge in Nurse Employment: Causes and Implications, Julu/August 2009.

[29] Teresa E. Seeman, Sharon S. Merkin, Eileen M. Crimmins, and Arun S. Karlamangla. Disability Trends Among Older Americans: National Health and Nutrition Examination Surveys, 1988–1994 and 1999–2004 ,American Journal of Public Health, November 12, 2009.

[30] Defined as professionals or paraprofessionals who are qualified by special training, education, skills and experience in providing health care, treatment and diagnostic services, under the supervision of or in collaboration with a licensed practitioner, and includes but is not limited to, physician assistants, registered nurses, licensed practical nurses, certified nurse assistants, home health aides, radiological technologists and technicians, medical therapists and other qualified technologists and technicians.

- Monitoring data and trends in allied health workforce including current and future:
    - supply and demand for allied health professions;
    - capacity of the state system of higher education to educate and train students pursing allied health professions;
- Develop recommendations for the formation and promotion of an economic cluster for allied health professions;
- Identify recruitment and retention strategies for public and independent institutions of higher education with allied health programs;
- Develop recommendations for promoting diversity in the allied health workforce;
- Develop recommendations regarding financial and other assistance to students enrolled in or considering enrolling in allied health programs offered at public or independent institutions of higher education;
- Identify recruitment and retention strategies for allied health employers;
- Develop recommendations about recruiting and utilizing retired nursing faculty members to teach or train students to become licensed practical nurses or registered nurses; and
- Examine nursing programs at public and independent institutions of higher education and develop recommendations about the possibility of streamlining the curricula offered in such programs to facilitate timely program completion.

The board held its first meeting in March 2005 and submitted its first annual report to the legislature in February 2006. The board meets regularly to discuss current state initiatives in allied health, and comprised a variety of stakeholders: state legislators, state agencies, higher education institutions, Workforce Investment Boards, high schools, professional associations and state agencies. It is a central repository for information about the multitude of efforts taking place by the various parties to address the nursing shortage. The executive director of the Connecticut Women's Education and Legal Fund is under contract to provide staff services to the board.

Although the board has no formal authority beyond what is outlined in statute, it has been very successful in fostering collaboration among the various partners and the institutions that they represent. It provides a formal mechanism for information to be exchanged and shared among parties working toward the common goal of addressing allied health workforce shortages.

Annual reports. The Allied Health Policy Board has submitted four annual reports to the legislature. The reports examine Connecticut Department of Labor data, vacancy survey data completed periodically by DOL and annually by the Connecticut Hospital Association, and other

targeted data to determine demand for allied health workers. The reports also contain descriptions and documentation on the status of various initiatives proposed the prior year, identify any outcomes that have resulted from previous initiatives, and propose recommendations for the following year. Finally, the report provides snapshots of separate efforts occurring outside the board, but aimed at producing a future supply of allied health graduates. The board's last annual report (February 2009) shifts much of the focus for the first time to other allied health professions - beyond nursing – in which worker shortages are anticipated.

Accomplishments. As noted above, sometimes the board acts as the lead for a particular strategy or initiative. At other times, it is involved in the decision-making process but another agency or entity serves as lead. Still other times, the board serves as a forum for initiatives undertaken, to share ideas about all of the collective and individual efforts by higher education intuitions to increase the number of nursing program graduates.

In the five years that the board has been in existence, multiple strategies have been successfully used to increase the number of RN nursing graduates, from associate degrees through doctorates. Program review committee staff found the Allied Health Workforce Policy Board has been a successful vehicle to bring together stakeholders and could be used as a model to address other specific workforce shortage areas. There were also countless examples of hospitals and other healthcare agencies partnering with public and private postsecondary institutions that allow for hospital nursing staff with master's degrees to act as preceptors (experienced nurses who facilitate student learning in a clinical setting), sponsoring scholarships for nursing students at every degree level, and sustaining an on-line program begun by Charter Oak State College to develop skills needed in hospital operating rooms.

There also are many initiatives between independent colleges and community colleges as feeder schools. Several articulation agreements with area colleges were developed for RNs with an associate degree to apply the credits earned toward a bachelor's degree in nursing. According to interviews conducted by committee staff, one reason for the generally high level of student success in nursing programs is that there is an emphasis on retention, not just recruitment. Efforts incorporated a range of institutions and ideas including accelerated second degree programs, promoting nursing even to middle school students, academic supports to reduce attrition of enrolled students, tuition subsidies, private and public grants, scholarships, outreach to high school students, and creation of career ladders through promotion and incentives.

In 1998, 318 LPN graduates passing the national exam that is required for licensure and by 2008, 727 individuals passed it, an increase of 129 percent. Similarly, in 1998, 569 individuals passed the national exam required for RN licensure and by 2008, 1,122 individuals passed it, a 97 percent increase. Thus, the implementation of a multitude of strategies has led to the successful increase in the number of LPNs and RNs and could be applied to address other workforce shortage areas such as:

- public advertising campaigns by colleges and universities to increase awareness of certain occupations as a career;
- initiatives at the high school level to interest students in certain careers;
- funding for schools to initiate new or expand exiting programs;

- the aggressive pursuit of federal, state, and private funding by colleges and universities, both collectively and individually, to provide tuition assistance, student advising, and targeted tutoring aimed at increasing retention;
- scholarships and loan forgiveness programs;
- collaborative partnerships between colleges and universities with business and industry to provide faculty, scholarship funding, and internship opportunities for students; and
- a formal mechanism, such as the AHWPB, for members to communicate and share strategies implemented by one college or university so that similar solutions could be applied by other postsecondary institutions, as well as the ability to propose solutions as a unified body.

Section III

RECOMMENDATIONS TO ADDRESS BARRIERS TO ALIGNMENT

The briefing report found an overall lack of alignment of postsecondary education and employment for a majority of occupations examined. (Excluded from this alignment analysis were the many broad college majors that lead to employment in a multitude of occupations.) While some occupations appeared to be particularly well aligned, such as registered nurses, the majority of occupations examined seemed to have an oversupply or undersupply of workers. The briefing report identified a number of barriers contributing to the misalignment of postsecondary education and employment. This section recommends potential solutions to overcoming the barriers, drawing on lessons learned from a detailed examination of the strategies used to successfully align postsecondary education and employment in the nursing profession as well as information learned in studying the emerging green collar jobs field.

Similar to the format of the earlier review of the barriers in the briefing, the associated recommendations are grouped into four general areas related to: 1) elementary and secondary school students in the knowledge/talent pipeline; 2) postsecondary education institutions; 3) difficulty in making accurate demand projections; and 4) state agency organization, programs, and policies.

Recommendations to Overcome Barriers Related to Elementary and Secondary School Students

As described in the briefing report, math and science literacy scores for high school students in the United States have declined from six years ago, ranking the U.S. below average in comparison to other industrialized countries. In Connecticut in particular, fourth and eighth grade students do not score as well in science, math and reading as students in other New England states. This poor performance is reflected in the increasing number of new college students requiring remedial or developmental courses because they are unprepared for college-level work. Several recommendations are made to address these barriers to the subsequent alignment of postsecondary education and employment.

Strengthen high school graduation standards. In the recently proposed high school redesign of Connecticut's high schools, SDE stated the following vision for Connecticut high schools: "Each student entering high school will graduate as a contributing citizen in a democratic society, and be prepared for college and work in a global society." This will require schools to increase graduation requirements to be more reflective of the skills and knowledge needed to succeed in a global economy. The proposed redesign and subsequent 2009 legislation (H.B. 6488) recommended a *change from 20 to 25 credits required to graduate high school, including increases in mathematics, science, and world language requirements.* While the proposed redesign was not adopted, the Connecticut State University System passed BR# 09-17, a resolution concerning the admissions policy for first-time first-year students, increasing mathematics, science, and world language requirements by July 1, 2015. *These more stringent requirements are necessary to prepare students for postsecondary education and the workforce needs of a global economy.* Therefore, **program review committee staff recommends that:**

Connecticut should pass legislation reforming Connecticut high school graduation requirements as recommended by the State Department of Education in their proposed high school redesign.

Increase efforts in high school to reduce the need for remediation in college. In a July 16, 2003 resolution, the CSUS Board of Trustees required students underprepared for college-level coursework in English and/or math, to demonstrate proficiency (i.e., pass remedial coursework) within their first 24 academic credits in order to register for any additional college courses.

CSUS efforts to reduce the need for remediation in college. Five years ago, in an effort to smooth students' transition from high school to college and decrease the number of students needing remediation in college, Western Connecticut State University partnered with Bethel and Danbury high schools to implement the "Building a Bridge to Improve Student Success" project. By *providing high school students with a better understanding of what is expected academically in college*, based on initial results on the Accuplacer placement test,[31] and *creating relationships between writing and math faculty at the university and high schools so that the high school teachers were aware of college standards and expectations*, the need for remediation once these students entered college was decreased. Initial data is promising, with the percent of Bridge students that would need remediation in college writing decreasing from 61 percent (per junior year testing) to 13 percent (per senior year testing), and for math a decrease from 62 percent to 41 percent during the same time period. The Bridges program has since expanded to all four Connecticut State University System colleges, and similar programs are becoming available at the community colleges and their feeder high schools.

Administration of Accuplacer placement exam to high school juniors. While college faculty are limited in the number of high school faculty they can partner with, at least *giving the Accuplacer placement exam to high school juniors will alert students to areas of weakness, and provide an opportunity to better prepare for college level work*, with an Accuplacer retest in senior year to confirm preparedness. The use of the Accuplacer or comparable test should be made available to all high school students early in the junior year, so that remaining time in high school can be put to good use filling in skills/knowledge gaps and preparing for postsecondary education. Low-cost/no-cost options to fill in gaps include use of online resources such as KeyTrain or ALEKS (Assessment and Learning in Knowledge Spaces).

In Connecticut, Gateway Community College and many of the New Haven public high schools have partnered to conduct early testing of high school students and offer developmental courses to improve student academic performance prior to transitioning to college.

At least two other states use the Accuplacer to test high school students early in the junior year. In response to concerns about the sizeable number of students unable to meet college-level reading and math requirements, for example, the Massachusetts Board of Higher Education recommended a pilot program offering the Accuplacer to 15,000 high school students during the

[31] The Accuplacer placement test was developed by the College Board (the not-for-profit association best-known for the SAT®, the PSAT/NMSQT® and the Advanced Placement Program® (AP®)), to determine the ability of entering students to be successful in college-level coursework, and whether one or more remedial courses are needed to improve their skills in reading, writing, or math.

junior year.[32] By making the assessment prior to college, 11th grade students are able to factor this information into decisions about how to prepare for college in the final years of high school.

Due to similar concerns about the lack of preparedness of entering college students, Minnesota also began offering the Accuplacer to high school juniors approximately five years ago, assessing reading comprehension, written English, and intermediate algebra.[33] All juniors at North Community High School, for example, take the Accuplacer in mid-October each year, and seniors planning to attend the Minneapolis Community and Technical College retake the exam at the end of their senior year. High school juniors who attain college-ready scores are given the opportunity to attend the community college, beginning in the summer after their junior year. Approximately two-thirds of Minnesota's 24 two-year public colleges have Accuplacer testing programs with their area high schools.

The cost for taking the Accuplacer was estimated to be approximately $12 per student. Given the current cost of $354 for a three-credit remedial or developmental course for a student at a Connecticut community college, it would certainly be less costly, and increase postsecondary education success, for students to make the best use of their last high school years by preparing for college-level work. Given budgetary constraints, students could pay the minimal cost of the online Accuplacer test (currently, $1.75 per assessment unit). Therefore, **program review committee staff recommends:**

> **All Connecticut high school juniors should be encouraged to take the Accuplacer or comparable test. Students may use their remaining time in high school to take additional preparatory coursework, utilize software programs such as KeyTrain, or a combination of these strategies to avoid remedial coursework in college.**

Recommendations to Overcome Barriers Related to Postsecondary Education Institutions

As discussed in the briefing report, Connecticut ranks nationally in the bottom 20 percent in associate degree completion rates. Although there are many reasons for attending community college, over half (55 percent) reported a primary goal of obtaining an associate degree, significantly less than the 10-11 percent annual graduation rate. Remedial coursework is one barrier to completing a degree or certificate, and recommendations to effectively address remediation are proposed along with several possible additional no-cost, low-cost strategies.

Use of computer assisted tools for remedial coursework. A major study recently completed in Minnesota on the linkage of higher education with workforce and economic development identified several barriers to adult participation and completion in community college: prior preparation and an absence of basic skills as well as time, cost, and relevance. To address the lack of preparedness for college level coursework, the researchers recommended a greatly improved approach to remedial and development education. Specifically, they recommended:

- More "fine-grained" assessment of deficiencies

[32] Massachusetts Board of Higher Education Early Assessment – Accuplacer, www.mass.edu.
[33] Minnesota Tech Prep Annual Performance Report FY 2005.

- Modularized instruction
- Use of technology
- A workplace-oriented approach (e.g., WorkKeys and KeyTrain)

An annual 50-state progress report on the alignment of high school policies with the demands of college and work noted that postsecondary remediation offers a second chance for many students, but often is unable to make up entirely for the inadequate preparation in high school. They found three-quarters (76 percent) of students who require remediation in reading, and nearly two-thirds (63 percent) who require remedial math, do not earn degrees. On the other hand, the study authors reported nearly two-thirds (65 percent) of students who did not need remedial coursework completed an associate or bachelor's degree. Beyond the association between need for remedial coursework and less chance of degree completion, a recent Connecticut Supreme Court case brief argued that because of inadequate educational opportunities, many Connecticut public school students are leaving school without the necessary skills and knowledge required to successfully pursue higher education or advanced vocational training opportunities. It further pointed out the costs of maintaining subsequently necessary remedial programs at community colleges for these unprepared students are more than $12.5 million annually.[34]

The PRI staff briefing report presented data on the success rate in developmental math courses for community college students. The community college system has identified a performance improvement goal (to be achieved by 2011) of 60 percent of developmental math students passing the courses—47 percent passed the courses in 2007.

The Connecticut Community College System has begun to use KeyTrain to assess and improve math and reading skills of students in the Bridges to Health Career Initiative, a grant awarded under the Community Based Job Training Grants, as implemented by the U.S. DOL, and discussed in Section II of this report). KeyTrain is an internet-based, self-paced, interactive skills tutorial. Used in many community colleges throughout the country, Georgia, for example, is using KeyTrain to evaluate the preparedness of students to take a college placement test (such as Accuplacer). Students not achieving the required level use KeyTrain to build skills or brush up on rusty skills, and then take the college placement test. Colleges in more than 30 states are currently using KeyTrain; its popularity may be due to its consistency with the approach recommended by the Minnesota researchers of using a more fine-grained assessment of deficiencies, modularized instruction, use of technology, and a workplace-oriented approach when addressing remedial/developmental needs of students.

With a performance improvement goal (to be achieved by 2011) of 60 percent of developmental math students at community colleges passing the course, and currently less than half passing the course using the current traditionally taught remedial and developmental courses, a different approach needs to be considered. KeyTrain is available to all Connecticut community college students, but appears to be underutilized, perhaps because students and/or faculty are

[34] Supreme Court of the State of Connecticut S.C. 28032, Connecticut Coalition for Justice in Education Funding, et al v. Governor M. Jodi Rell, et al. Brief of Amici Curiae (The Workforce Alliance, The Workplace, Inc., The Bridgeport Regional Business Council, and the Connecticut Women's Education and Legal Fund), January 11, 2008

unfamiliar with the software program. **Therefore, program review committee staff recommends that:**

> **Computer-assisted preparation programs such as KeyTrain should be promoted at all the community colleges. Results should be monitored for two years to determine whether use of the selected computer-assisted preparation program should be continued.**

Use of contextual learning for remedial courses. In addition to computer-assisted remediation, the literature suggests that contextual learning may be more effective than stand-alone remedial courses. According to one author, strengthening education and training for the mid-skilled labor force requires an integrated approach to providing remedial education. Rather than providing a freestanding class with little connection to the student's subject area of interest, experience- or work-based learning provides students with an understanding of how the remedial competencies are needed for future jobs.

Contextual learning for remediation is being used in some community colleges and secondary schools. Springfield Technical Community College (MA), for example, has developed a course called Introduction to Business, aimed at students contemplating a career in business but needing some remediation. The course itself uses a business text and covers some topics from standard business courses -- business practices, business-related vocabulary and concepts, familiarity with different business careers -- but uses a variety of materials, including computers, music, and video, for students whose reading levels are not yet adequate for more advanced courses such as accounting and management.[35]

Contextual learning has also been found successful, for example, in Asnuntuck Community College's Manufacturing Technology Center certificate and degree programs, where they apply theory in practice. Also, in Gateway Community College's Center for a Sustainable Future, math and English skills are taught in an embedded manner as part of the subject matter the students are learning about in the green field. Contextual learning is also an important element in Connecticut's technical high schools.

Contextual or embedded remedial material within an applicable setting of interest to the student may be more successful than a stand-alone remedial or developmental course, and also qualify the student for federal funding through a Pell Grant, a funding source which is not available for the noncredit, remedial courses. **Therefore, program review committee staff recommends:**

> **The Connecticut Community College System should consider replacing stand-alone remedial courses with introductory credit courses that integrate remedial skills instruction.**

The successful use of contextual learning for remedial courses may have expanded application for education and training in green collar fields. Contextual learning may be particularly

[35] Working in the Middle: Strengthening Education and Training for the Mid-Skilled Labor Force, by W. Norton Grubb, San Francisco: Jossey-Bass Publishers, 1996.

relevant for current members of the workforce taking courses or obtaining certificates to enhance skill sets with green knowledge and technology.

No-cost/low-cost degree or certificate completion recommendations. Statistics used to determine graduation rates from community colleges are calculated based solely on full-time students who begin their education at an institution and graduate from the same community college within three years. Because so many community college students are part-time students, and often transfer into or out of a community college, the graduation rates tend to be lower than those of four-year college graduation rates (using a six-year time frame).

With this caution in mind, student retention and subsequent degree or certificate completion is still of particular concern to the community college system. Community colleges are the gateway to higher education, with many of the students first in their families to attend college. As noted in the briefing report, the Connecticut community college system has the 43rd lowest graduation rate in the country.

Aware of the challenges for students completing degree or certificate programs, the legislature passed Special Act 07-9. This act required the chancellor of the Connecticut Community College System to develop a plan to increase three-year graduation rates for the system's institutions from 10-11 percent to the national norm for peer community colleges, which is currently 15 percent. The resulting completion and graduation rate improvement plan included a variety of efforts. One key strategy was adding full-time faculty and student services personnel to allow for such initiatives as expanded services in academic skills centers, crisis counselors, and retention specialists. There is evidence that these strategies would lead to improved retention and graduation rates; however, given the current economic challenges, the required funding for these initiatives is often unavailable. Given that the failure of students to complete degrees or certificates presents a barrier to preparing the well-educated workforce needed for the 21st century, other no- or low-cost strategies should be implemented.

One strategy where research has shown effectiveness is an early warning system, where instructors monitor student academic success and intervene early when students appear to be struggling. New York's Hudson Valley Community College has adopted an early warning system in recognition that it increases the college's ability to offer the student access to needed support. An instructor who is concerned about a student's academic progress issues an alert letter in the third week of the semester, requesting that the student schedule an appointment to discuss issues and "move forward with a plan for the successful completion of the semester."[36] The University of Connecticut also implements an early warning system as one of several programs that are intended to foster student success. In the first six weeks of freshmen year, if a student receives a D or an F on a test, the student will be counseled one-on-one to go for extra help or receive some other needed intervention. The university noted that it is not uncommon for students to have such experiences, with about 20 percent of students getting a D or F in one or more courses in their first six weeks of college.

[36] Hudson Valley Community College Early Warning System Alert Letters, Fall 2009 (https://www.hvcc.edu/issr/ews.html).

A second strategy (mentioned earlier) that is beneficial for remediation is use of KeyTrain or other software to help students prepare for college level coursework. Research has shown the strong relationship between need for remediation and poor success in degree completion. However, a Massachusetts task force on retention and completion rates at Massachusetts community colleges found that early completion of developmental coursework positively influences retention and graduation rates. Students who completed developmental coursework in their first semester had a three-year graduation rate of 19.1 percent compared with just a 3.8 percent graduation rate for students who did not complete the developmental coursework in the initial semester.[37]

A third strategy to consider is the use of peer tutors, perhaps supplied in part through work-study assignment of students who excel in the particular subject area.

Because budgetary constraints are projected to continue into the near future, community colleges and other Connecticut colleges faced with lower than desired graduation rates, should pilot and expand no- or low-cost initiatives, such as the ones described in this section, wherever possible to improve intention and completion rates. Therefore, **program review committee staff recommends:**

> **Connecticut colleges should implement no- or low-cost initiatives to improve graduation rates. Success or failure of efforts should be shared with all colleges on the DHE website.**

These no- or low-cost initiatives can be used to promote successful completion of newly developed certificates in green and other emerging fields. By incorporating strategies such as early warning systems, use of KeyTrain or other software to help students prepare for college level coursework, and/or peer tutors, the outcomes for students in green certificate programs can be strengthened.

Day care. Finally, as noted in the staff briefing report, higher education is increasingly being asked to provide non-academic support services to students, particularly within the community college system. Evidence suggests that students, particularly at the community college level, have more social service needs, because they are often older, part-time, and commuters, and have additional work and family responsibilities. Recently, in a September 2009 publication by the Connecticut Association for Human Services (Connecticut's Challenge Preparing Our Workforce Strengthening our Community Colleges) noted, "once a working adult student enters college, the ability to complete an Associate's or a Bachelor's degree depends on a variety of factors. Income and college preparation are the most influential, but access to financial aid, child care and transportation assistance, and academic and personal counseling also impact student longevity."38

In recognition of one of these needs, all twelve community colleges have child care services. (See Appendix J for detail). There may be capacity concerns, in that as of November 2009, eight of the 12 colleges had waiting lists, ranging from a low of two children at one college to a high of 129

[37] Massachusetts Board of Higher Education Final Report from the Task Force on Retention and Completion Rates at the Community Colleges, February 2007.
[38] Roberts, B. and Povich, D. (2006). *Promoting Student Success in Community Colleges by Increasing Support Services.* Washington, DC: Working Poor Families Project, Policy Brief. Fall 2006.

children at another. In total there were 374 children on the wait lists, although it is unknown whether they were children of students, faculty members, or individuals residing in the community. Other features of the child care services are:

- six of the colleges offer day care during the summer sessions, while six do not;
- the majority accept children age 3 or 4 years old, while only two served infants;
- few have early evening hours; and
- the fees charged range from free to $28 dollars for a full day (half time is also available).

Recommendations to Overcome Barriers Related to Workforce Demand Projections

The briefing report described several barriers to projecting where Connecticut's current and near-future workforce needs will be. Apart from difficulties in making accurate projections, with just 36 percent of 10-year projections accurate to within 10 percent of actual estimates, there were also barriers related to awareness of the job demand projections and also to responsiveness to the projections. Recommended solutions to addressing these barriers impacting the alignment of postsecondary education and employment are described in this section.

Accuracy of projections. The briefing report contained a staff analysis of Connecticut DOL job demand projection accuracy. PRI staff found that, in general, the ability to forecast 10 years out the types of jobs that will be available is limited. The 10-year projections are based on long-term trends such as labor force growth rate and population age, and do not take into account changes due to new technologies, medical breakthroughs, disasters, etc.

Shorter-term occupational projections, such as two years out, have their own drawbacks, particularly as they are impacted by economic cycles. Instead of gathering information from employer surveys, the Connecticut DOL and neighboring states are exploring the use of job vacancy rate data for making short-term projections of near future job demand. With recently approved federal grant funding,[39] information on current and near future green job opening projections may be developed using sophisticated automated systems and analyses of electronic job postings. PRI staff supports this initiative to improve the accuracy of shorter-term occupational projections. Therefore, **program review committee staff recommends that:**

> **The State Department of Labor should continue to pursue development and use of an electronic job vacancy methodology to provide current and near-future information on job demand in Connecticut.**

As described in Section I of this report, estimates of the size of the green collar workforce varied dramatically, ranging from 5,493 to more than 22,000 individuals, due in part to current lack of agreement on the definition of green collar jobs. The job vacancy information to be compiled by the Northeast Research Consortium with funding from the recently awarded ARRA grant will be useful to the unemployed, underemployed, and high school students considering green collar careers.

[39] Northeast Research Consortium "Making 'Green' Real" Grant, U.S Department of Labor, Approved: (12/1/09-5/31/11).

Teacher shortage areas. One barrier identified in the briefing report was the lack of awareness about existing incentives that were adopted to encourage individuals to seek employment in projected teacher shortage areas. Currently, a letter from the commissioner of education to all superintendents of schools is sent each spring, listing the certification endorsements that have been designated by SDE as teacher shortage areas for the upcoming school year. The legislature adopted a program in July 1, 2000 (P.A. 00-187) that created a state mortgage assistance program for certified public school teachers who: 1) teach in one of the shortage areas ; 2) are employed by a priority or transitional school district, or 3) are employed by a technical high school located in a priority or transitional school district.

While teacher shortage information is known to school districts, there is no similar letter sent to Connecticut public and independent colleges with teacher preparatory programs. Greater distribution of this information is consistent with a strategy published by the State Department of Education a decade ago,[40] to "widely disseminate information on expected shortage and non-shortage assignment areas using a variety of distribution media (web pages, bulletins, and advertisements)." By notifying faculty and career counselors who advise and interact with students on a regular basis, there is a greater likelihood that information about shortage areas (i.e., high demand teaching areas) will become known to students considering careers in teaching.

Additionally, SDE is required to identify teacher shortage areas on an annual basis for the federal loan deferment/repayment programs that are available for teachers who teach in a subject shortage area. However, since teacher preparation requires four years, it is unrealistic to assume that information on incentives that are available for a single year will influence teaching areas that students might spend the next few years training in.

PRI staff found that similar shortage areas are identified from year to year by SDE, and information on teacher shortage areas for the past five years would provide more practical information to students on where anticipated teacher shortage areas are expected at a point when the student will be ready to enter the workforce. Therefore, **program review committee staff recommends that:**

> **The State Department of Education should annually compile and electronically distribute to all Connecticut public and independent colleges with teacher preparatory programs information for at least the past five years on teacher shortage areas.**

Awareness of job demand projections. As described in the briefing report, the Connecticut DOL does periodic mass mailings of certain publications, such as "Connecticut Career Paths" and the "Connecticut Career Resource Network Update," which is mailed to more than 2,000 high school teachers, counselors, and administrators in the state. The publication contains information about various occupations, job outlooks, wages, education and training routes, and educational and employment resources available.

[40] Public School Educator Supply and Demand in Connecticut: A Look Toward the 21st Century, State of Connecticut Department of Education, 1999.

There is also a wealth of information contained on the Connecticut DOL website; however, it requires initiative and awareness that such information exists in order to seek it out. The "Soaring to New Heights" report, for example, is available on the Connecticut DOL website and provides a useful snapshot of jobs currently in greatest demand by training level. The publication was recently reduced from six to four pages to save paper, and therefore, money; in doing so, however, information on teacher occupations in demand was eliminated.

Changing to an electronic distribution of this report would potentially expose many more high school and college teachers, counselors, and administrators to job demand information that could then be shared with students making decisions about their future careers. The recent cost-saving measure of report size reduction would not be a factor for an electronically mailed document. Also, transitioning to electronic mailing of "Soaring to New Heights" is consistent with current consideration by Connecticut DOL staff to electronically mailing some of their publications. Therefore, **program review committee staff recommends that:**

> **The State Department of Labor should electronically mail the "Soaring to New Heights" report to all state high schools and colleges, returning to the earlier format that includes information on teacher occupations in demand.**

Responsiveness to projections. Beyond providing existing publications - such as Connecticut Career Paths, and Connecticut Career Resource Network Update to high schools and colleges - it is unclear how useful this information is to the educational institutions and colleges. There may be additional or different information that would be more helpful to students in making career decisions. There may be another format in which the existing report information would be more accessible to the high school and college teachers, advisors, and students.

The Connecticut DOL has previously surveyed some of its customer audiences; however, *Connecticut DOL staff could not recall having previously surveyed high school guidance counselors and college admission officers/career counselors to see what information would be most useful to them*. Therefore, to promote the use and usefulness of Connecticut DOL publications by high schools and colleges, **program review committee staff recommends that:**

> **The State Department of Labor should survey high school guidance counselors, college admission officers, and college career counselors to determine what information and in what format would be most helpful to students in making career decisions.**

Recommendations to Overcome Barriers Related to State Agency Organization, Programs, and Policies

There is a strong link between the supply of an educated workforce and a state's competitiveness in an increasingly global economy. Thus, one facet of Connecticut's economic standing is the ability of its colleges and universities to produce graduates with the skills needed by Connecticut's employers. In addition, an available and educated workforce is a major resource in attracting new businesses to the state.

Connecticut's higher education organizational structure, policies it promotes, and programs it funds can impact the alignment of postsecondary education and the workforce needed by Connecticut's businesses and industries. The types of programs and policies that influence alignment include state-funded strategies to ensure high school students are college-ready, providing academic and non-academic supports to students to improve retention and graduation rates, and offering scholarships that encourage students to enter careers in critical worker shortage areas. Other factors that affect alignment are the state's organizational structure for its higher education system, where program funding decisions are made, and ultimately how those decisions are integrated with the priorities of state agencies responsible for workforce and economic development.

Since the purpose of this study was not to reorganize the higher education system, committee staff propose several recommendations within the existing structure focused on the issue of the education role in developing the workforce and supporting the state's economy. Recommendations are aimed at strengthening the coordinating and policy-making role of the Board of Governors of Higher Education by requiring it to:

- develop a master strategic plan that links together the roles of the separate constituent units and includes how the higher education system relates to the P-12 system and workforce needs of the state;
- develop strategies in the plan, along with the four constituent units, to implement if colleges and universities fail to make progress on the specific accountability measures already being reported on; and
- examine whether academic programs or career pathways need to be established in order to meet the workforce needs of competitive sector-based employers in Connecticut, based on information developed by the Office of Workforce Competitiveness

Public Higher Education and Strategic Planning

Many efforts have been made through statute to develop a systemwide plan based on overarching goals for Connecticut's post-secondary education system. These include:

- Board of Governors for Higher Education Master Plan (1982);
- Accountability Report (1999); and
- Blue Ribbon Task Force Strategic Plan (2007).

The authorizing statute for each of these efforts sets out core goals to be achieved by the higher education system, and each includes at least one goal directly related to the state's economic development needs (see Table III-1). However, the BGHE master plan has never been developed and the blue ribbon task force established in 2007 to create a strategic plan has yet to been appointed. The accountability report, though, has been developed and produced each year, and contains performance measures and data analysis that access public college and university progress towards meeting the statutorily-defined goals.

Table III-1. Comparison of Statutorily-Required Higher Education Goals to be Promoted.		
BGHE Master Plan to be Consistent with Following Goals (C.G.S. Sec. 10a-b(b)	***Goals to be Measured in Accountability Report (C.G.S. Sec. 10a-6b)***	***Blue Ribbon Task Force Strategic Master Plan Promoting these Overall Goals (C.G.S. Sec. 10a-11b(3)(b)***
Ensure that no qualified person be denied the opportunity for higher education on the basis of age, sex, ethnic background or social, physical or economic condition	Enhancing student learning and promoting academic excellence	Ensure equal access and opportunity to post-secondary education for all state residents
To protect academic freedom	Joining with elementary and secondary schools to improve teaching and learning at all levels	Promote student achievement, including student performance, retention and graduation
Provide opportunities for education and training related to the economic, cultural and educational development of the state	Ensuring access and affordability of higher education	**Promote economic competitiveness in the state**
Assure the fullest possible use of available resources in public and private institutions of higher education	**Promoting the economic development of the state to help business and industry sustain strong economic growth**	Improve access to higher education for minorities and nontraditional students, including, but not limited to part-time students, incumbent workers, adult learners, former inmates and immigrants
Maintain standards of quality ensuring a position of national leadership for state institutions of higher education	Responding to the needs and problems of society	Ensure the state's obligation to provide adequate funding for higher education
Apply the resources of higher education to the problems of society	Ensuring the efficient use of resources	
Foster flexibility in the policies and institutions of higher education to enable the system to respond to changes in the economy, society, technology and student interest.		

The Board of Governors for Higher Education and strategic planning. The Board of Governors for Higher Education, legislatively created in 1982, is the central policy-making authority for public higher education in Connecticut. It is intended to serve as a coordinating body for all of the public and independent colleges, universities, and postsecondary institutions in the state. As noted in the staff briefing, Connecticut's public higher education is decentralized and each of the constituent units has a high degree of independence to meet the varied needs of its students. Even within the Connecticut Community College and Connecticut State University Systems, the individual colleges and universities have specific individual missions. While this has often produced excellent initiatives that link academic programming to employer need at the regional level, these

efforts are rarely consistent or institutionalized at the state level and, therefore, may be creating unnecessary inefficiencies and redundancies.

Under C.G.S. Sec. 10a-6(b), the Board of Governors for Higher Education is statutorily required to develop a master plan for higher education consistent with seven statutory goals (shown in the left column of Table III-1). However, *program review staff found that no plan exists and DHE staff could not recall when the last plan was developed or provide PRI staff with a copy*.

Blue Ribbon Task Force and strategic planning. The legislature recognized the lack of a master plan and the importance of establishing one for Connecticut's postsecondary system when it created a Blue Ribbon Task Force in 2007, charged with developing and implementing a strategic master plan by October 1, 2008. The legislation listed five goals that the plan was to promote (in the right column of Table III-1), some of which are similar to the goals required to be addressed by the BGHE master plan.

The legislation establishing the task force identifies nine major issues facing the higher education system and permitted the task force to consider:

- establishing incentives for institutional performance and productivity;
- increasing financial aid programs, particularly in workforce shortage areas and for minority students;
- implementing mandatory college preparatory curricula in high school and aligning it with curricula in institutions of higher education;
- seeking partnerships with the business community and public institutions of higher education to serve the needs of workforce retraining including the establishment of bridge programs to meet demand in workforce shortage areas;
- establishing collaborative partnerships between public high schools and institutions of higher education;
- implementing programs in high school to assist high school students seeking a college track or alternative pathways;
- developing policies to promote and measure retention and graduation rates of students;
- addressing the education needs of minority and nontraditional students; and
- addressing the affordability of tuition at institutions of higher education.

Relevant to the PRI study, and as part of its charge, the task force is required to:

- examine the impact of demographics and workforce trends on higher education in the state;
- address the challenges related to increasing the number of students earning bachelor's degrees in the state, increasing the number of young people entering the state's workforce, and the disparity in the achievement gap between minority students and the general population;

- recommend ways in which the state's higher education institutions can, consistent with their respective missions, expand their role in advancing the state's economic growth; and
- review the higher education board of governors' master plan for higher education and strategic plan for racial and ethnic diversity, and the Nellie Mae Foundation report titled, "New England 2020: A Forecast of Educational Attainment and its Implications for the Workforce of New England States. "

In developing the strategic plan, the task force is to consider several factors including how to partner public higher education institutions with the business community to move students into workforce shortage areas, and strategies necessary to promote and measure retention and graduation rates. To date, however, the task force has not been constituted.

Accountability measures and strategic planning. Public Act 99-285 (codified at C.G.S. Sec. 10a-6b) required the Higher Education Coordinating Council, which was composed of the chairman of the boards of trustees and the chief executive officers of each constituent unit (i.e., chancellors), and the commissioners of higher education and education, and the Secretary of the Office of Policy and Management to develop accountability measures for each constituent unit and each public institution of higher education. The act listed six new goals (identified in the middle column of Table III-1) in which progress is to be measured:

- enhancing student learning and promoting academic excellence;
- joining with elementary and secondary schools to improve teaching and learning at all levels;
- ensuring access and affordability of higher education;
- promoting the economic development of the state to help business and industry sustain strong economic growth;
- responding to the needs and problems of society; and
- ensuring the efficient use of resources.

Accountability report. Since 2001, each constituent unit and BGHE has annually submit an accountability report to the DHE commissioner, who then compiles the information and submits a consolidated report to the Higher Education and Employment Advancement committee by February 1 each year. The report also includes updated baseline and peer comparison data, performance improvement targets for each measure, and other information as determined by the commissioner.

Accountability report. The report, called *Higher Education Counts Achieving Results*, contains a primary mission for Connecticut's higher education system, six statutorily-define goals , noted above in Table III-1, benchmarks, and performance indicators to measure progress towards achieving the established goals for the system as a whole, as well as by constituent unit. One of the components of the mission statement is to "meet the workforce needs of the state's economy." The report provides key data on the performance of the state's public colleges and universities over time, and could be used as baseline data in the General Assembly's ongoing efforts to incorporate the principles of Results-Based Accountability within its decision making processes.

Committee staff believes that the six goals, performance indicators and improvement goals, along with the baseline data already contained in the *Higher Education Counts* report should be incorporated into the strategic planning recommended below. Unlike some states that already have strategic higher education plans but little performance based data, BGHE and the constituent units already has measure performance since 2001. Thus, the more difficult part is already completed and the broader system vision and strategic plan will set a long-term direction for the system.

Committee staff believes a strategic plan for higher education is critical to the optimum coordination of education with economic and workforce development efforts. Many elements that should be included in a strategic master plan are already captured in the *Higher Education Counts* report produced by DHE. However, other elements still need to be developed such as establishing a vision for the higher education system and determining the actions necessary to implement the plan. In addition, a plan should provide a blueprint for linking the various goals and responsibilities of colleges and universities under the larger umbrella of the postsecondary system. The plan should address three other components of the talent pipeline: 1) strategies to smooth the transition from the P-12 education system to the higher education system; 2) strategies to link the adult education and workforce development systems funded under the federal Workforce Investment Act to the higher education system; and 3) strategies to align the types of graduates it produces with the workforce needs of Connecticut's businesses and industries.

The Board of Governors of Higher Education is the appropriate entity to develop the plan since it is the policy-making and coordinating body across all higher education systems. **Therefore, program review committee staff recommends:**

C.G.S. Sec. 10a-11b establishing the Blue Ribbon Task Force and requiring the task force to develop a strategic master plan every five years shall be repealed and its responsibilities, along with its reporting requirements, be transferred to the Board of Governors for Higher Education.

C.G.S. Sec. 10a-6(a)(2) requiring the Board of Governors for Higher Education to develop a master plan shall be amended to include the word "strategic."

The goals that the Board of Governors for Higher Education, the Blue Ribbon Task Force, and the Accountability Measures are required to promote, be blended into a single set of goals that the strategic master plan should address. The goals identified in C.G.S. Sec. 10a-6(b) for the accountability report shall be adopted and amended to include the goal of protecting academic freedom and maintain standards of quality ensuring a position of national leadership for state institutions of higher education.

On or before January 1, 2011, and every five years thereafter, the Board of Governors for Higher Education shall prepare a higher education strategic master plan for the state. The plan shall be prepared in consultation with the Higher Education Coordinating Council, which includes the commissioner of the Department of Education and the Secretary of the Office of Policy and Management, and the commissioners of the Departments of Labor, and

Economic and Community Development, the director of the Office of Workforce Competitiveness, the chairpersons and ranking members of the Higher Education and Employment Advancement and the Commerce committees, and the chairperson of the board and president of the Connecticut Conference of Independent Colleges, and the president of the Connecticut Business and Industry Association, or their respective designees. The Board of Governors for Higher Education may consult with other entities as determined by the board.

The plan shall be submitted to the Governor and the Commerce, Education, Higher Education and Employment Advancement, and Labor Committees.

The board shall report biennially on progress made toward achieving the benchmarks in the strategic plan.

Performance accountability. *Although the Higher Education Counts report has included performance measures and statistics on whether those measures are being met since 2001, there are no identified strategies put forth to address continued sub-par performance.* For example, there are common core performance indicators associated with each state-level goal including retention and graduation rates. The most recent 2009 report shows the three-year graduate rate of first-time, full-time degree or certificate seeking students at community colleges was 10 percent for the cohort of students who entered in fall 2004; this rate is less than the 15 percent rate for all peers combined.

Of the more than 50 goals contained in the 2009 Higher Education Counts report, over one-third were unmet. Lack of response to performance data was a concern raised several times in a review of Connecticut's Achieving the Dream Program by external evaluators.[41] The additional step of identifying strategies that the constituent unit intends to implement to address unmet goals will move the effort from simply passively reporting what is observed to identifying ways to meet the performance goal. **Therefore, program review committee staff recommends:**

C.G.S. Sec. 10-6b(g) shall be amended to require each constituent unit of the state system of higher education and the Board of Governors for Higher Education to submit strategies to improve performance and achieve results on unmet goals or performance measures as part of its annual accountability report to the commissioner, along with funding estimates for each proposed strategy. The commissioner of the Department of Higher Education shall include these strategies in its annual consolidated report to the Higher Education and Employment Advancement Committee. The commissioner shall also submit the report to the chairpersons and ranking members of the Commerce and Education Committees.

In addition to the problem of not identifying strategies to counter stagnant or declining trends, PRI staff found some goals already were being met at the time they were set (i.e., the bar had

[41] "Achieving the Dream in Connecticut: State Policies Affecting Access to, and Success in, Community Colleges for Students of Color and Low-Income Students," by Kevin K. Dougherty and Monica Reid, Community College Research Center, Teachers College, Columbia University, November 11, 2006.

been set too low). Other statistics in the report may inaccurately reflect certain trends regarding student transfer between public colleges and universities. For example, graduation rates are reported by each constituent unit and college or university, but only are counted if first-time freshmen continue in the same school and obtain a degree (per federal rules, states are required to measure graduation rates in a three-year time frame for community college students and six-year period for public institutions offering baccalaureate programs). In reality, many students move from community colleges to other public colleges or universities without ever having degrees awarded, while others do not meet the established three- or six-year time frame but ultimately do graduate. These federal requirements do not preclude Connecticut from reporting graduation rate statistics to reflect this reality.

Program review committee staff also believes the report could be more user-friendly in terms of a report card grade or an arrow next to a goal that shows the reader immediately if the goal has been met or progress is being made towards achieving it.

To address these deficiencies, **program review committee staff recommends:**

Beginning July 1, 2010, the Higher Education Coordinating Council shall review the accountability measures developed under C.G.S. 10-6(b)(g), and every five years thereafter, determine their continued validity, or need for revision. Any revisions or deletions shall be submitted to the Board of Governors for Higher Education for approval.

Upon BGHE approval, the commissioner of the Department of Higher Education, on behalf of the council, shall notify the committees of cognizance on any measures that were revised or deleted, with a brief explanatory statement.

The Achieving Results Higher Education Counts report should include a letter grade or other symbol that represents, at a glance, whether or not the goal is being achieved.

According to the Department of Higher Education the Higher Education Coordinating Council was constituted and it did develop the accountability measures. However, PRI staff were told by DHE staff that the council has not met for some time (the last time could not be remembered and no meeting minutes exist) and its composition was changed at some point to include only the chief executive officers before becoming inactive. Department staff indicated that the commissioner is making plans to reconstitute the council.

PRI committee staff find since the statutory mandate was never eliminated, the council should still be functioning since it presents an opportunity for collaboration and discussion around various inter-constituent unit issues, as well as promotes the concept of a state-wide focus. **Therefore, program review committee staff recommends:**

The Higher Education Coordinating Council should be reconstituted in accordance with C.G.S. Sec. 10a-6a.

Rewarding outcomes. Also noted in the briefing is that the Board of Governors no longer has budget authority over the constituent units. Although a single consolidated budget is submitted to the legislature by the board, appropriations are made directly to each of the constituent units. Rewarding colleges or universities that are making progress towards or meeting the already established and legislatively approved goals contained in the *Higher Education Counts* report is one way in which incentives to encourage innovative practices can be provided.

Although committee staff realizes that the state is in the midst of a serious financial crisis, in the future, providing a discretionary pool of dollars to DHE to reward constituent units or individual college or university performance towards improving or meeting goals should be considered. This pool of money would be similar to the Health and Education Initiative funds, discussed in Section II, that currently give discretion to the DHE commissioner to fund postsecondary initiatives in these two areas. **Therefore, PRI staff recommends:**

> **Within available appropriations, a pilot program shall be established within the Department of Higher Education to be used at the discretion of the commissioner, to reward colleges, universities, or systems that are meeting pre-established goals.**

Linking the Postsecondary Education System to Competitive Sector-Based Jobs

In Connecticut, the current state organizational structure to facilitate the coordination of postsecondary education with workforce development issues involves a myriad of agencies, boards, higher education institutions, offices, councils, and commissions. Some have overlapping responsibilities, but there is no single entity with authority to implement across-the-board strategies, policies, or programs.

In the absence of a major restructuring of Connecticut's higher education system, such as centralizing budgetary authority within BGHE and basing a portion of a college's funding on graduation outcomes, program review committee staff believes an approach developed by the Office of Workforce Competitiveness (and adopted by the Connecticut Employment and Training Commission) could improve the ability of the postsecondary system to promote Connecticut's economy. This approach links the establishment of postsecondary career pathways to economic sectors, such as technology and healthcare, which Connecticut views as economic drivers. It also builds on all the workforce components of the system, incorporates higher education into the design, and then links it to Connecticut's most competitive sectors.

The approach integrates the adult education system and the workforce development that is primarily funded under the federal Workforce Investment Act, with the postsecondary education system, and connects them to jobs in competitive sectors of Connecticut's economy. Figure III-1 illustrates the flow of students who may enter the postsecondary system at one level and, upon exit, find a competitive sector-based job, or progress to the next educational level by building on an already articulated career pathway.

This framework also recognizes the organizational constraints imposed by the federal government on the workforce development system through the federal Workforce Investment Act

and the structure that must be in place to receive those funds. The proposed framework is based on the perspective and needs of the students and adult individuals being served by the regional Workforce Investment Boards and seeks to more formally integrate that system with the public postsecondary system, and to careers available in vital sectors of Connecticut's economy.

> **The Office of Workforce Competitiveness, in consultation with the Connecticut Employment and Training Commission, the Departments of Higher Education, Education, Labor, and the Economic and Community Development, shall identify the sectors or sub-sectors in which career pathways need to be established, the workforce skills needed in those sectors, and the types of postsecondary programs that need to be developed to address the workforce needs in those sectors. The information shall be provided to the Board of Governors for Higher Education biennially.**

Creation of career pathways for employment in competitive industries. Many states, including Connecticut, are beginning to create new or grow existing academic programs in order to better align the production of graduates with businesses and industries that are experiencing shortages of skilled workers. Economic development policy recognizes that if a skilled workforce does not exist, the state will be less likely to attract certain businesses because it is too expensive for companies to come here and import the workforce from other states. The state may also lose existing businesses if there is not a readily available workforce.

Because of the decentralized nature of the public higher education system, a high degree of coordination and collaboration is necessary to ensure Connecticut's colleges offer a wide range of academic programs at all levels to prepare students for 21st century jobs. As the central policy-making body, the BGHE should be able to readily identify the strengths and weaknesses that exist across the systems and propose solutions that have impact beyond just a single constituent unit.

Currently, BGHE approves new and discontinued academic programs for most colleges and universities in the state, but the proposal is generated by the individual college or university. Committee staff believes that BGHE could also exercise a proactive role, based on information produced by the Office of Workforce Competitiveness in the recommendation above, in identifying where program certificate or degree gaps exist and how the public system of higher education can address those gaps.

In addition, this is when articulation agreements among colleges should be developed so that career pathways providing for easy transfer of students can be more seamless. This also could be an area for the Higher Education Coordinating Council to examine when it is reconvened and it could put forth recommendations to BGHE. Since the board has a statewide perspective, the board could issue an annual statement identifying areas of need in order to attract either public or private colleges to offer a new program. Otherwise, changes will continue to be incremental and depend solely on the initiative of each constituent unit, college within each unit, or independent institution. **Therefore, PRI staff recommends:**

> **Using information developed by the Office of Workforce Competitiveness, the Higher Education Coordinating Council shall make recommendations to the**

Board of Governors for Higher Education regarding postsecondary certificates and/or degree programs needed to address any shortages, or if existing programs lack capacity to address shortage areas.

Strategies should be identified that will promote ongoing alignment of educational and business needs to meet the demand for qualified graduates at all educational and training levels, from middle-skills certificates and degrees to post-doctoral education and research. Promoting career pathways is particularly important in Connecticut as the demographic changes that are anticipated over the next decade will likely have more students entering postsecondary school at the community college level.

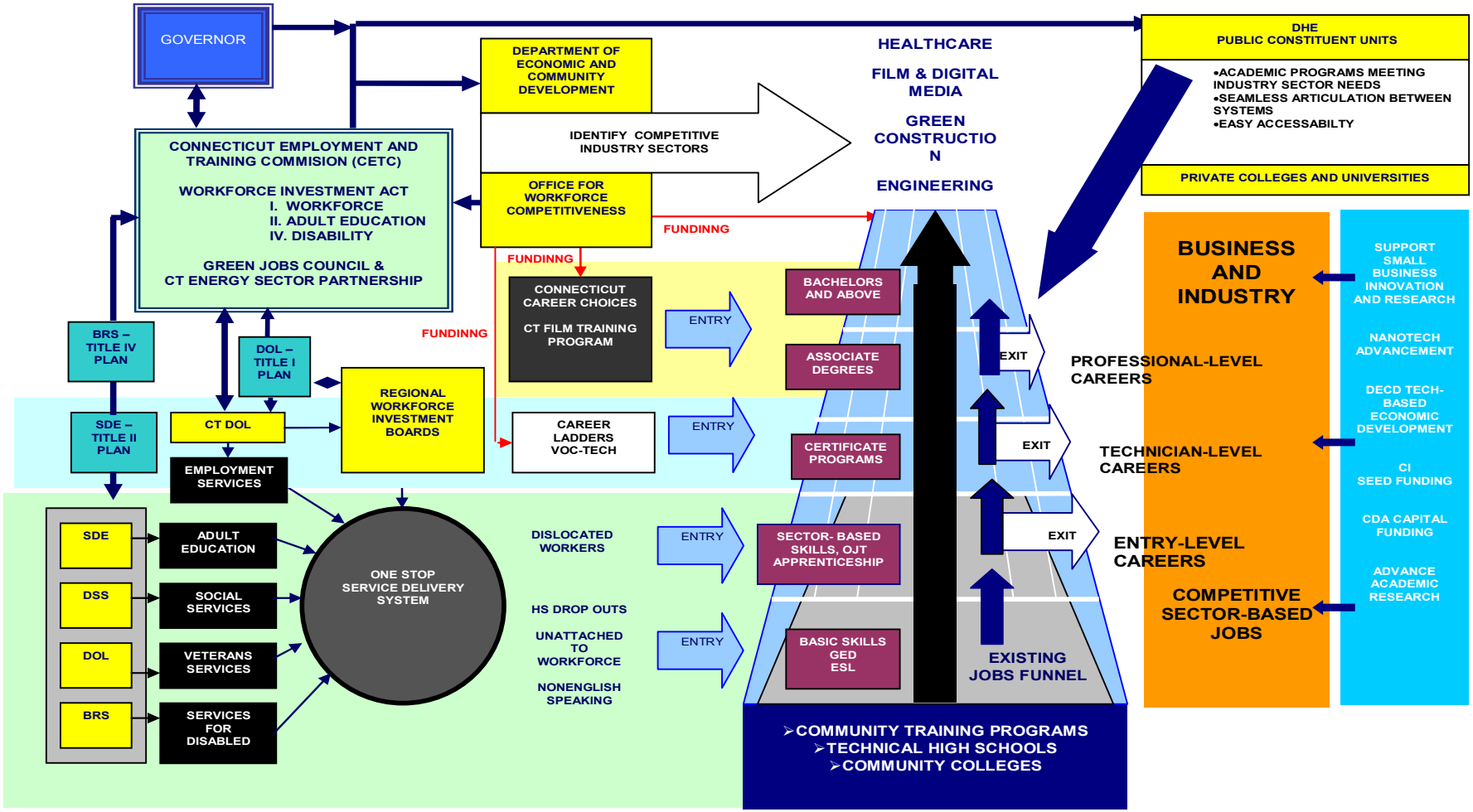
Newly Proposed Coordinating Body

As noted in the staff briefing report, the recently released *Economic Strategic Plan* developed by the Department of Economic and Community Development states that the way for the state to remain competitive is by growing talent and being prepared for the technological jobs of the future. To accomplish this, there are several strategies identified in the plan. To provide oversight and ensure implementation, the department proposed a new Workforce and Education Cabinet be established.

The cabinet would consist of the following members: the commissioners of SDE, DHE, DOL, and DECD (or designees); the secretary of OPM (or designees); the heads of OWC, the Connecticut Development Authority, and Connecticut Innovations, Inc.; and the chairs of the State Board of Education, the Board of Governors for Higher Education; and the boards of trustees of UConn, UConn Health Center, Connecticut State University System and the state community college system.

Among the strategies the cabinet would provide oversight for and are related to this study include: 1) building the capacity for economic and workforce analysis, including examining occupational supply and demand information; and 2) increasing the number of postsecondary students seeking degrees in STEM areas, by creating a $100 million, public-private student loan partnership, offering loan forgiveness in critical shortage occupations such as science and engineering.

Figure III-1. SECTOR-BASED EDUCATION AND TRAINING PATHWAY



Source: Office of Workforce Competitiveness

Technical High Schools and Adult Programs

Currently the Connecticut Technical High School system offers six adult education programs. Five of the programs are in the health field and one is offered in the aviation maintenance. The programs are:

- licensed practical nurse;
- dental assisting;
- certified nurse assistant;
- medical assistant;
- surgical technology; and
- aviation maintenance technician.

Governor Rell recently suspended the LPN program offered at the ten technical schools, although individuals who are currently enrolled will be allowed to complete the program. Noting that the LPN program has operated since the 1950s, a spokesperson for the state Department of Education stated that the program is for adults and is not part of the technical schools' core mission.

Program review committee staff believes that the Connecticut Community College System is a better location to offer adult education programs now provided at technical high schools, particularly since career pathways already exist for some programs, such as for LPNs seeking to enroll in RN programs. Offering programs through the community college system also exposes adults to a higher education environment where other career opportunities are more apparent. **Program review staff recommends:**

> **The Connecticut Community College System, in consultation with the commissioners of the state Department of Education and the Department of Higher Education, and the superintendent of the Connecticut Technical High School system, shall examine the feasibility of transferring the adult education programs currently offered by the technical high schools, including the licensed practical nurse program, to the Connecticut Community College System.**
>
> **The Board of Trustees for the Connecticut Community College System shall report to the legislative committees of cognizance on the feasibility of such a transfer including the cost of such transfer, the number of employees that would be impacted, and if such a transfer occurred, the geographic locations where the programs could be offered by October 1, 2010.**

APPENDICES

Appendix A

Summary of ARRA Green Grants Awarded to or Pending for Connecticut

Appendix A. ARRA Green Grants Awarded or Pending for Connecticut	
Grant	**Purpose/Description**
State Energy Program (SEP) • $38,542,000 • U.S. Dept. of Energy • Approved: 4/1/09-3/31/12	• Funding will be used to provide financial incentives for a variety of specific energy efficiency (EE) programs to address improvements in residential, commercial, institutional and industrial buildings • Primary activities would include "equipment replacement, installation, or modification" • Funding will also be used to incentivize "renewable" energy (RE) in the areas of geothermal heat pumps, solar photovoltaic, fuel cell, and solar thermal (include equipment installation and modification) • Some funds will support the Department of Energy's clean cities coalitions • A small portion of the funds will be used for the training of building operators and for training of building officials
DSS Weatherization Assistance Program $64,310,502 U.S. Dept. of Energy Approved: 4/1/09-3/31/12	• The State will use existing community action agency (CAA) network, as well as other entities, to operate the ARRA WAP: o Action for Bridgeport Community Development, Inc. (ABCD) – Bridgeport o The Community Renewal Team, Inc. (CRT) – Hartford & Middletown o New Opportunities, Inc. – Waterbury and Meriden, New Haven service area o The ACCESS Agency, Inc. – Willimantic o CT DECD • DECD will provide ARRA weatherization services to state public rental housing units throughout the state • 7,500 units will be weatherized • Training and Technical Assistance will be used for: o Statewide lead safe training on new DOE minimum standards o Energy auditor certification training class (CSG) o On-site training for crews, energy auditors and subcontractors o Mold and moisture detection training o Annual combustion safety refresher training o Client education training o OSHA training for new staff and subcontractors • The two-week core competency training is designed includes courses in basic competencies, safe work practices, building evaluation, measure installation, final inspection, consumer education, monitoring, program management and training • In addition Crew Worker, Crew Chief, Inspector, Monitor and Auditor certifications and requirements are designed as on-the-job training as well as one- to two-day courses • In response to the expected demand for more trained auditors to handle the increased number of units that will be weatherized, DSS has already scheduled two auditor certification classes for June and September 2009 on the Nome Check Energy Audit (the only audit currently approved by DOE for use in CT)
Grant	**Purpose/Description**

Energy Efficiency & Conservation Block Grant $24,522,900 U.S. Dept. of Energy Approved: 8/1/09-7/31/12	• 90% of grant will be used to provide sub-grants to 143 units of local government that are not eligible for direct formula grants • Projects have to be consistent with State of CT's energy policy framework (C.G.S. Sec. 16a-35k) and Governor Rell's Connecticut Energy Vision Plan o Under this framework, CT has established energy efficiency, conservation, renewable and green house gas reduction goals that include: ▪ A 20% reduction in electric-peak grid consumption by 2020 ▪ A 20% reduction in fossil fuel consumption by 2020 ▪ Commercial transportation fuels to include a mixture of 20% alternative fuels by 2020 ▪ Residential and commercial heating oil to include a mixture of 20% alternative fuels by 2020 ▪ By 2020, a 10% reduction in GHG (greenhouse gas) emission as compared to 1990 levels ▪ By 2050, an 80% reduction in GHG emissions as compared to 2001 levels • 10% of grant will be used to provide competitive sub-grants to towns that partner with other towns to implement projects that will be of a regional benefit
SOAR (Sustainable Operations: Alternative and Renewable Energy Initiative) $2,000,000 U.S. Dept. of Labor Approved: 2/15/09-2/14/12	• Creates eight credit certificate programs, 24-30 credits each 1. Sustainable Facilities Management (Three Rivers cc) 2. Sustainable Landscape Ecology & Conservation Technician (Three Rivers cc) 3. Building Efficiency & Sustainable Technologies Certificate/Sustainable Facilities Management (Norwalk cc) 4. Alternative Energy Transportation (Gateway cc) 5. Clean Water Treatment (Gateway cc) 6. Solar Energy Technologies (Gateway cc) 7. Alternative Energy Systems (Naugatuck Valley cc) 8. Sustainable Energy Certificate (Manchester cc) 9. #1 and #2 started Fall 09; #3-8 to begin Spring '10 10. Five Regional Program Coordinators will: 1. facilitate recruitment, retention, completion and job placement 2. offer academic and career counseling and case management services 3. work in partnership with One-Stops, high schools and community organizations to raise awareness of emerging career pathways 4. forge connections with regional alternative and renewable energy employers and assist with outcomes tracking 11. 320 students will earn a CCCS Sustainable Operations Certificate in one of the eight areas 1. 85% of SOAR students will enter employment 2. Regional Coordinators will work with 900 clients/students, train 350 One-Stop and high school counselors 3. 20 college instructors will receive professional development training, and will train 800 students annually 4. 1,500 people will benefit from SOAR capacity-building activities
Grant	**Purpose/Description**
SMART (Skills for Manufacturing	• 12 community colleges jointly developed SMART to provide a systemwide response to CT's manufacturing workforce challenges • The Regional Center for Next Generation Manufacturing, strengthens career pathways through the CCCs College of

and Related Technologies) Initiative $2,191,400 U.S. Department of Labor Approved: 4/1/08-3/30/11	Technology (a "virtual college") • CT Center for Advanced Technology serves as a lead partner; also involves SDE (including technical high schools), CBIA, WIBs • Program targets adult ed learners, veterans, ethnic minorities, immigrants, young workers aged 18-27, and young women • Creates/expands three certificate programs: o Pre-manufacturing certificate program (offered at all 12 CCCS colleges) to improve student success in higher-level programs by increasing skills and academic/career awareness (500 hours, non-credit) o Level One Precision Manufacturing Certificate program (expanded from two colleges to five) with common core competencies, transferable skills and credentials, manufacturing-specific education components, and more extensive work-based learning (600 hours, for credit?) o Level Two Precision Manufacturing Certificate program offering specialties in precision machining and CNC technologies, welding technology, and electronics control technology, and featuring a paid internship (18-credits) • Outcome to result in 331 CCCS students achieving credentials in the three target certificate programs
Northeast Research Consortium "Making 'Green' Real" Grant $3,999,923 ($250,000 for CT) U.S Department of Labor Approved: 12/1/09-5/31/11	• Includes 6 New England states plus New York and New Jersey • Vermont will lead the consortium and serve as the fiscal agent • The consortium will be governed by a steering committee consisting of the eight LMI directors • There will be nine research and dissemination task groups: o Defining "green" o Building a "green" coding tool o Real time demand analysis o Short term vacancy projections o The use and extension of current LMI tools o Creation of electronic dissemination tools o Publications o Outreach to local partners o Creation of Green Job Banks • Consortium's research and dissemination work to be conducted in four phases: o Creating definitions and coding tools o Demand analysis projections o Use and extension of current LMI tools, data collections and databases o Creation of electronic and other dissemination tools including green job banks

Grant	Purpose/Description
Green Capacity Building Grant YouthBuild Bridgeport, The Workplace, Inc., Bridgeport $59,894 U.S. Department of Labor Approved: 12/1/09-11/30/10	• Intended to build the green training capacity of current DOL grantees • Goal to train 20 students (17-24 years old) currently enrolled in the YouthBuild project prepare for careers in emerging energy-efficient green building construction and retrofit industries • Successful completion of the program will qualify graduates for Carpenters Union, Local 210 apprenticeship programs • Will also train five local instructors by trainers from the Home Builders Institute
Green Capacity Building Grant YouthBuild Hartford, Co-Opportunity, Inc., Hartford $69,933 U.S. Department of Labor Approved: 12/1/09-11/30/10	• Intended to build the green training capacity of current DOL grantees • Goal to train 20 students (17-24 years old) currently enrolled in the YouthBuild project prepare for careers in deconstruction (dismantling buildings with goal of preserving reusable materials and reducing landfill needs) • Also certify 2-3 YouthBuild instructors as trainers for deconstruction, and provide internships to 3 YouthBuild students
Pathways Out of Poverty The Workplace, Inc., Southwestern CT's WIB (Bridgeport)) "Green-up Bridgeport" $5 million U.S. Department of Labor **Pending**: Approx. 1/1/10-12/31/12	• Focus on entry level skills in established occupations that are projected to have increased demand • Majority of the jobs do not require a postsecondary university degree, but usually work related experience, short, moderate or long-term on the job training, or postsecondary vocational award • Education and training offered by ECSU, CCSU, Gateway CC, Housatonic CC, Norwalk CC, and University of Bridgeport • Will serve 600 participants in beginning education and training activities

Grant	Purpose/Description
CT Green Jobs Partnership (SESP) $3,360,000 U.S. DOL **Pending**: 1/1//10-12/31/12	• Comes out of Gov. Exec Order #23 • The CT State Energy Sector Plan for grant developed under CETC, under the guidance of the CT Green Jobs Partnership ("The Partnership") o Purpose to implement the strategic workforce plan of the CT Green Jobs Partnership to make the entire state/CT a world leader in the development of a workforce prepared for careers in EE and RE industries and for jobs that clean and enhance the environment—this also positions CT to overcome high energy costs and stimulate economic growth • Competitive grants for worker training and placement in high growth and emerging industry sectors • State Energy Sector Partnership (SESP) and Training Grant • Picks up funding of SOAR Project Director after SOAR Grant expires (Current grant aligning with existing initiative) • Building Analyst Training at the CT Community Colleges, to obtain BPI certification for instructors, equipment, and training of 100 candidates (over three years) • Green Manufacturing –Lean/Green to train 30 to get certificates • Clean Water Technicians (Certification at Wastewater Technician Level III)for 65 between Goodwin and Gateway • Municipal Building Officials Training in RE/EE Inspection for 180 via Institute for Sustainable Energy at ECSU—three half-day workshops for building code officials • Green Jobs Training Incentive Fund to respond to employer needs as part of business incentive package with other financial supports (average of $4,000 per trainee—190 trainees) • SDE will promote need for STEM skills in green jobs for K-12 system and Adult Ed programs • DHE will promote partnership across 4-year colleges, and increase articulation agreements with high schools and community colleges • CT Technical High School System will inform its guidance counselors of partnership processes and opportunities and will work to define programs related to green jobs to be offered at technical high schools • CT Community College System will work to ensure alignment, including SOAR Energy Initiative, weatherization training, and 47 other related programs across the CCCS—they will also work to refine articulation agreements with high schools and four-year colleges • Goodwin College Environmental Studies Department will offer its wastewater management certificate program through the partnership • Institute for Sustainable Energy at ECSU will deliver proposed Municipal Building Officials Training with DPS, and help develop green career ladders for jobs related to energy efficiency in new and existing commercial building • The CT Clean Energy Fund supported the planning process by providing info about initiatives and investments related to clean energy and helping identify key workforce development needs and existing training offerings. CCEF will invest training funds in programs to develop the RE workforce • Will target incumbent workers needing to upgrade their skills to meet new green job function demand (and qualify for advancement/wage increases), and un- and underemployed needing training to secure a job on a green career pathway

Grant	Purpose/Description
***Energize CT!* A Statewide Energy Training Partnership** (CEWD – CT Energy Workforce Development Consortium) $2,210,800 U.S. Department of Labor • **Pending**: Approx. 1/1/10-12/31/12	• Is a public-private consortium of energy related business, academic and government representatives, which develops solutions to meet the workforce needs of energy and energy-related companies • CBIA Education Foundation will manage this project/grant • Will train 766 workers in three growing occupations: o Solar PV/solar thermal/geothermal installers o Diesel engine mechanics o Energy efficiency building managers
Pathways Out of Poverty (Capital Workforce Partners WIB) $3,066,880 U.S. Dept. of Labor **Pending**: Approx. 1/1/10-12/31/12	• Purpose to transform and "green" its Hartford Job Funnel, a nationally recognized, highly successful grassroots workforce preparation partnership • Will place 350 Hartford residents in jobs in the green construction and sustainable energy generation industries • CWP will provide skills training in these fields in addition to math and science refreshers, opportunities to earn a range of postsecondary certificates and degrees, adult basic ed, ESL, GED prep, as needed • Four categories identified for this grant: o Unemployed individuals o High school dropouts o Individuals with criminal records o Disadvantaged individuals in high poverty areas • Three employer/business partners will identify emerging job opportunities, advise on curriculum selection and revision, and assist with job placement: o CT Center for Advanced Technology (CCAT) (focus on sustainable energy industries such as fuel cells, hydrogen, and renewables) o CT Construction Industry Association/Associated General Contractors of CT (CCIA/AGC) o Minority Construction Council (MCC) • CCSU's Institute for Technology and Business Development (ITBD) will develop a 90-minute orientation to the emerging green economy for use with all participants, and a week-long introduction to sustainable energy generation • Other postsecondary institutions will provide green-focused certificate and degree programs that participants will access via individual training accounts (ITAs) leveraged through CWP • Three labor partners will contract to provide green construction training and assist with subsequent placements: o New England Laborers' Training Academy o Ironworkers Local #15 Apprenticeship Program o Finishing Trades Institute of Southern New England (FTISNE) • Participants will have support from a designated case manager employed by one of the CBO partners
Source: PRI staff analysis of federal green grant applications.	

Appendix B

Appendix B. Green Occupations as Indentified by the Connecticut Department of Labor		
Management • General and Operations Managers • Administrative Services Managers • Industrial Production Managers • Farmers and Ranchers • Construction Managers • Engineering Managers • Natural Sciences Managers	**Business and Financial Operations** • Purchasing Agents and Buyers, Farm Products • Cost Estimators • Management Analysts • Meeting and Convention Planners • Business Operations Specialists, All Others	**Computer and Mathematical Science** • Computer Software Engineers, Applications • Computer Software Engineers, Systems Software • Operations Research Analysts
Architecture and Engineering • Architects, Except Landscape and Naval • Landscape Architects • Agricultural Engineers • Chemical engineers • Civil Engineers • Electrical Engineers • Electronics Engineers, Except Computer • Environmental Engineers • Mechanical Engineers • Architectural and Civil Drafters • Environmental Engineering Technicians **Sales and Related** • Sales Representatives, Wholesale and Manufacturing	**Life, Physical, and Social Science** • Soil and Plant Scientists • Conservation Scientists • Foresters • Atmospheric and Space Scientists • Chemists • Environmental Scientists and Specialists, Including Health • Geoscientists, Except Hydrologists and Geographers • Hydrologists • Urban and Regional Planners • Chemical Technicians • Environmental Science and Protection Technicians, Including Health • Forest and Conservation Technicians	**Legal** • Lawyers **Education, Training, and Library** • Farm and Home Management Advisors **Arts, Design, Entertainment, Sports, and Media** • Commercial and Industrial Designers **Healthcare Practitioner and Technical** • Occupational Health and Safety Specialists **Protective Services** • Fish and Game Warden
Building and Grounds Cleaning and Maintenance • Janitors and Cleaners, Except Maids and Housekeeping Cleaners • Landscaping and Groundskeeping Workers • Tree Trimmers and Pruners	**Office and Administrative Support** • Customer Service Representatives • Couriers and Messengers • Dispatchers, Except Police, Fire and Ambulance • Production, Planning , and Expediting Clerks • Shipping, Receiving and Traffic Clerks • Executive Secretaries and Administrative Assistants • Secretaries, Except Legal, Medical, and Executive • Office Clerks, General	**Farming, Fishing, and Forestry** • First-Line Supervisors/Managers of Farming, Fishing and Forestry Workers • Agricultural Inspectors • Farmworkers and Laborers, Crop, Nursery, and Greenhouse • Farmworkers, Farm and Ranch Animals • Forest and Conservation Workers

Construction and Extraction

- First-Line Supervisors/Managers of Construction Trades and Extraction Workers
- Boilermakers
- Carpenters
- Cement Masons and Concrete Finishers
- Construction Laborers
- Paving, Surfacing, and Tamping Equipment Operators
- Pile-Driver Operators
- Operating Engineers and Other Construction Equipment Operators
- Electricians
- Glaziers
- Insulation Workers, Floor, Ceiling, and Wall
- Plumbers, Pipefitters, and Steamfitters
- Roofers
- Sheet Metal Workers
- Structural Iron and Steel Workers
- Helpers-Carpenters
- Helpers-Electricians
- Construction and Building Inspectors
- Hazardous Material Removal Workers
- Rail-Track Laying Maintenance Equipment Operators

Transportation and Material Moving

- Bus Drivers, Transit and Intercity
- Truck Drivers, Heavy and Tractor-Trailer
- Locomotive Engineers
- Railroad Conductors and Yardmasters
- Subway and Streetcar Operators
- Crane and Tower Operators
- Industrial Truck and Tractor Operators
- Laborers and Freight, Stock, and Material Movers, Hand
- Refuse and Recyclable Material Collectors

Installation, Maintenance, and Repair

- First-Line Supervisors/Managers of Mechanics, Installers, and Repairers
- Electrical and Electronics Repairers, Commercial and Industrial Equipment
- Automotive Service Technicians and Mechanics
- Bus and Truck Mechanics and Diesel Engine Specialists
- Bicycle Repairers
- Heating, Air Conditioning, and Refrigeration Mechanics and Installers
- Industrial Machinery Mechanics
- Maintenance and Repair Workers, General
- Millwrights
- Electrical Power-Line Installers and Repairers
- Helpers-Installation, Maintenance, and Repair Workers
- Installation, Maintenance, and Repair Workers, All Others

Production

- First-Line Supervisors/Managers of Production and Operating Workers
- Electrical and Electronic Equipment Assemblers
- Engine and Other Machine Assemblers
- Structural Metal Fabricators and Fitters
- Team Assemblers
- Computer-Controlled Machine Tool Operators, Metal and Plastic
- Cutting, Punching, and Press Machine Setters, Operators, and Tenders
- Machinists
- Welders, Cutters, Solderers, and Brazers
- Printing Machine Operators
- Cabinetmakers and Bench Carpenters
- Water and Liquid Waste Treatment Plant and System Operators
- Chemical Plant and System Operators
- Plant and System Operators, All Other
- Chemical Equipment Operators and Tenders
- Separating, Filtering, Clarifying, Precipitating, and Still Machine Operators
- Mixing and Blending Machine Setters, Operators, and tenders
- Inspectors, Testers, Sorters, Samplers, Weighers

Source: Plan to Develop Green Industries and Green Jobs in Connecticut. Prepared by the Departments of Labor and Economic and Community Development, June 2009.

Appendix C

Emerging Occupations in the Green Collar Field

Appendix C. Emerging Occupations in the Green Collar Field	
• Power Purchaser & Carbon Trader	• CHP (combined heat and power) Installers and Operators
• Renewable Energy Site Assessor	• Ice Storage Technician
• Geothermal Assessment Specialist	• Biofuel Processing Technician
• Tradesmen and Supervisors for Energy Efficiency Construction	• Fuel Cell Technician
• Renewable Energy Systems Installer	• Sustainability Coordinator
• Building Automation Specialist	• Advanced Transportation Systems Technician
Source: Presentation by William Leahy, Director of the Institute for Sustainable Energy at Eastern Connecticut State University, "Preparing Connecticut's Workforce for Green Collar Jobs," EPA Technical Forum, February 24, 2009.	

Appendix D

Information on Number of Connecticut Residents Working in Green Industries

Connecticut DOL estimates. The Connecticut DOL estimates the number employed in various green jobs by counting, regardless of occupation, the number employed in a green industry, based on whether the North American Industry Classification System (NAICS) manual defines the particular industry as producing a product or service that contributes directly to preserving and enhancing the quality of the environment. Using this definition, there were 22,373 Connecticut residents working in green industries (Table D-1). Staff from the Connecticut DOL said while the greatest numbers of green jobs in Connecticut are currently in waste management and remediation, the most lucrative jobs are in hydroelectric power generation.[42]

Table D-1. Estimated Number Employed in 2007 in Connecticut's Green Industries

Industry	Estimated Number Employed in 2007
Waste management and remediation services	7,168
Research & development in biotechnology	2,452
R&D in physical, engineering, & life sciences	2,369
Water supply and irrigation systems	2,231
Administration of environmental programs	1,389
Recyclable material merchant wholesalers	1,006
Environmental consulting services	978
Other technical consulting services	720
Nature parks and other similar institutions	637
Sewage treatment facilities	631
Environment and conservation organizations	540
Zoos and botanical gardens	418
Air purification equipment manufacturing	258
Hydroelectric power generation	139
Geophysical surveying and mapping services	25
Other[a]	1,412
Total	**22,373**

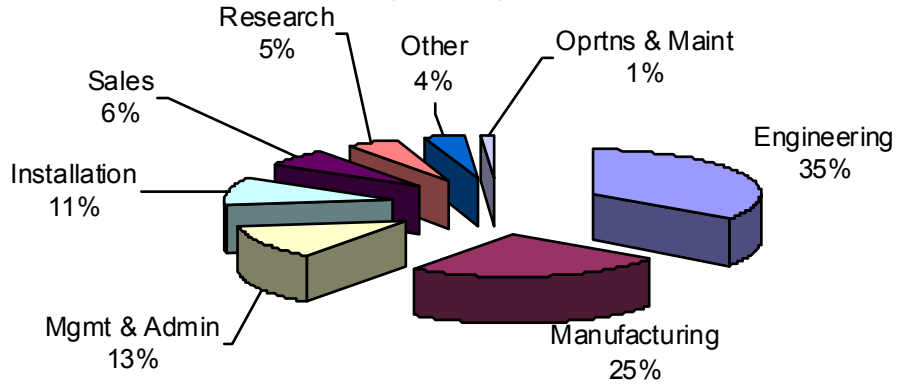
[a]Includes nuclear electric power generation, other electric power generation, steam and air-conditioning supply, and ethyl alcohol manufacturing.
Source: Office of Research, Connecticut Department of Labor, December 2008 Economic Digest.

Estimate of green collar jobs based on their contribution to renewable energy and energy efficiency. In addition to the Connecticut DOL projections, a recent study by Navigant Consulting, Inc., also estimates types of Connecticut green jobs in renewable energy and energy efficiency areas. Commissioned by the Connecticut Clean Energy Fund, working in partnership with the Connecticut Energy Efficiency Fund and the Department of Economic and Community Development, the purpose of the three-phase Navigant study was to identify effective ways to support and accelerate growth of the RE/EE industry in Connecticut. The goal of the first phase of the study was to estimate jobs, employment income, and revenue of renewable energy and energy efficiency companies operating in Connecticut.

[42] Quoted in March 2, 2009 Hartford Courant article, "Green-collar Jobs': Two Rell Directives Would Create Environmentally Oriented Projects."

Figure D-1 shows 60 percent of the 1,691 renewable energy (RE) jobs are in engineering and manufacturing.

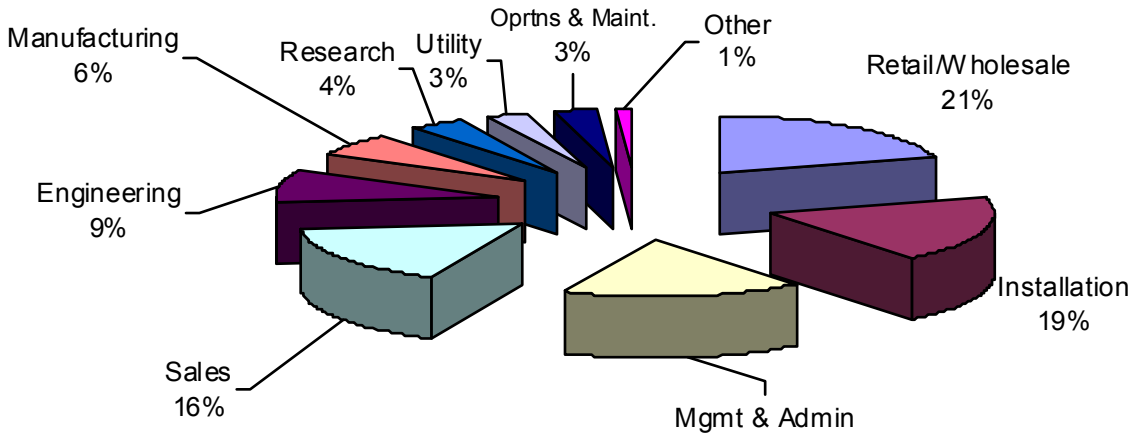
Figure D-1. Renewable Energy (RE) Jobs by Job Type in Connecticut (N=1,691)



Source: CT Renewable Energy/Energy Efficiency Economy Baseline Study, Navigant Consulting, Inc.

On the other hand, the 2,675 energy efficiency (EE) jobs are found primarily in retail/wholesale, installation, management and administration, and sales (Figure D-2).

Figure I-4. Energy Efficiency (EE) Jobs by Job Type in Connecticut (N=2,675)



Source: CT Renewable Energy/Energy Efficiency Economy Baseline Study, Navigant Consulting,

The Navigant baseline study also developed low and high estimates of the number employed in green industry segments using the REMI model[43] and data from the Connecticut DOL. The largest number of jobs is in the electrical equipment and appliance manufacturing segment, with sizable numbers of jobs also found in wholesale trade and construction (Table D-2). These estimates represent less than one percent of the Connecticut workforce (0.27 percent); however, there is potential for double digit growth as the U.S. RE/EE industry expands as expected despite the current economic downturn. Most of Connecticut's energy efficiency jobs are in the service sectors (2,137 jobs), and renewable energy jobs primarily in the fuel cell sector (1,200 jobs). The fuel cell and solar industries, for example, are expected to account for 89 percent of the renewable energy jobs in Connecticut (71 percent and 18 percent, respectively).

Table D-2. Number Employed in Connecticut RE/EE Industry Segments in 2007

Industry	Total # of CT Jobs	Estimate of # of RE/EE Jobs		Percent of CT Industry that are RE/EE Jobs
		Low est.	High est.	
Electrical equipment and appliance manufacturing	4,464	1,530	1,867	34%-42%
Wholesale trade	7,340	470	824	6%-11%
Construction	16,870	313	805	2%-5%
Retail trade	5,814	390	577	7%-10%
Machinery manufacturing	3,314	270	564	8%-17%
Plastics and rubber products manufacturing	381	191	267	50%-70%
Fabricated metal product manufacturing	584	161	251	28%-43%
Nonmetallic mineral product manufacturing	360	113	192	31%-53%
Computer and electronic product manufacturing	2,601	89	174	3%-7%
Waste management and remediation services	411	80	169	19%-41%
Professional and technical services	720	36	101	5%-14%
Wood product manufacturing	74	19	36	26%-49%
Forestry and logging; fishing, hunting, and trapping	10	1	3	10%-30%
Total	**42,943**	**3,663**	**5,830**	**8%-14%**

Source: "Connecticut Renewable Energy/Energy Efficiency Economy Baseline Study," Navigant Consulting, Inc.

[43] The REMI model is well-known economic analysis tool developed by Regional Economic Models Inc.

Appendix E

LEED Certified Buildings in Connecticut as of November 2009

Appendix E. LEED Certified Buildings in Connecticut as of November 2009			
Project Name	**Owner**	**City**	**LEED Rating**
401 Merritt 7 Corporate Park	Albert D Phelps as Managing Agent for Me	Norwalk	Silver
Aetna Customer Center	Aetna	Hartford	Silver
Amistad Street Building	YSM Facilities, Construction & Renovatio	New Haven	Gold
Barnard Environmental Magnet School	New Haven Board of Education	New Haven	Gold
BIC Renovations & Improvements	BIC Consumer Products	Shelton	Certified
C Smart Dealership	inskip automotive group	Fairfield	Certified
CBNA, Downtown Bridgeport		Bridgeport	Certified
Citi GWM - Stamford FSP		Stamford	Certified
Foodshare, Inc. New Distribution Facilit	Foodshare	Bloomfield	Certified
GE - Norwalk, CT	GE CPSO	Norwalk	Certified
GE CP SO		Stamford	Gold
GE Real Estate - 3rd, 4th, & 5th Fl	GE	Norwalk	Certified
Greenwich Academy Middle School	Greenwich Academy	Greenwich	Silver
Hotchkiss new residence halls	Hotchkiss School	Lakeville	Gold
Kohls Department Store- Waterbury, CT		Waterbury	Certified
L.L. Bean South Windsor, CT	L.L.Bean, Inc.	South Windsor	Silver
Malone Engineering Center		New Haven	Gold
Monahan building	Hotchkiss School	Lakeville	Gold
Newtown Youth Academy	Bulk Materials International	Newtown	Silver
Pfizer Clinical Research Unit	Pfizer	New Haven	Silver
Pratt & Whitney Building G	Pratt & Whitney	East Hartford	Silver
SCSU New Residence Hall	CT DPW	New Haven	Certified
South Residential Village	Department of Public Works	Willimantic	Certified
Stevens Building	New Canaan Country School	New Canaan	Silver
Stop&Shop, #605		Glastonbury	Certified
Stop&Shop, #614		North Berlin	Certified
Stop&Shop, #621		Southbury	Certified

Project Name	Owner	City	LEED Rating
Stop&Shop, #632		Rocky Hill	Certified
Stop&Shop, #665		E. Lyme	Certified
Stop&Shop, #673		Fairfield	Certified
Stop&Shop, #699		South Windsor	Certified
The Children's School	The Children's School	Stamford	Certified
The Mark Twain House & Museum Center	The Mark Twain House & Museum	Hartford	Certified
UConn - Burton Complex & Shenkman Center	University of Connecticut	Storrs	Silver
USCG Research and Development Center	Corcoran Jennison	New London	Silver
WCSU Residence Hall and Parking Garage	Department of Public Works	Danbury	Certified
Wesleyan University Fauver Field Residen	Wesleyan university	Middletown	Certified
Yale Art & Architecture	Yale University	New Haven	Gold
Yale Sculpture Building	Yale University	New Haven	Platinum
Yale SHM C3 Renovations	Yale University	New Haven	Gold
Yale Stoeckel Hall	Yale Office of Facilties	New Haven	Gold
Yale University Chemistry Research Build	Yale University	New Haven	Silver
Source: LEED Project Directory, U.S. Green Building Council.			

Appendix F

Salary and Education Required for New and Emerging Green Collar Occupations

Appendix F. Salary and Education Required for New and Emerging Green Collar Occupations		
Occupation	**Average Salary**	**Required Education Level**
Green Building Equipment Supplier	$51,000	None
Weatherization Installer and Technician	$27,000	Short-term training
Wind Turbine Technician	$36,000	High School Diploma
Solar Installer/Solar Thermal System Technologist	$31,000	High School Diploma (plus training, certificate)
Environmental Science & Protection Technician	$42,160	Associate's
Environmental Engineering Technician	$54,876	Associate's
Building Inspector	$51,654	Associate's
Sustainable Architect	$97,000	Bachelor's
Green Chemist	$71,000	Bachelor's
Fuel Cell Engineer	$70,000	Bachelor's
Environmental Engineer	$62,000	Bachelor's
Biofuel Engineer	$82,000	Bachelor's
Solar Engineer	$77,000	Bachelor's
Hydroelectric Engineer	$63,000	Bachelor's
Wind Turbine Engineer	$65,000	Bachelor's
Energy Efficiency Engineer	$71,000	Bachelor's
Energy Auditor	$65,000	Associate's or Bachelor's
Renewable Energy Consultant	$33,000	Bachelor's
Wind Energy Consultant	$70,000	Bachelor's
Solar Energy Consultant	$84,000	Bachelor's
Carbon Management Specialist	$55,000	Bachelor's
Environmental Policy Analyst	$64,000	Bachelor's
Sustainability Coordinator	$47,000	Bachelor's
Fuel Cell Technician	$39,000	Bachelor's
Environmental Consultant	$65,843	Bachelor's
Hydrologist	$64,250	Master's
Geoscientist	$82,389	Master's
Sources: Connecticut Energy Education, Institute for Sustainable Energy at Eastern Connecticut State University (www.ctenergyeducation.com/greenjobs.htm). May 2008 State Occupational Employment and Wage Estimates – Connecticut, U.S. Bureau of Labor Statistics (http://www.bls.gov/oes/2008/may/oes_ct.htm#b00-0000). Connecticut Career Resource Network Update, Spring/Summer 2009. Connecticut Economic Digest, a joint publication of the Connecticut Department of Labor and the Connecticut Department of Economic and Community Development, December 2008.		

Appendix G

Results of the Connecticut Conference of Independent Colleges Survey for the PRI Study of the Alignment of Postsecondary Education and Employment

In July 2009, the Connecticut Conference of Independent Colleges (CCIC) offered to survey its members to provide information relevant to the alignment of postsecondary education and employment.

The following 14 independent colleges and universities completed the survey:

- Albertus Magnus
- Connecticut College
- Fairfield University
- Goodwin College
- Mitchell College
- Rensselaer
- Sacred Heart University
- Saint Joseph College
- Trinity College
- University of Bridgeport
- University of Hartford
- University of New Haven
- Wesleyan University
- Yale University

Questions covered such topics as need for remedial coursework, career advising, process for adding new programs and degrees, and job attainment following graduation. A summary of the responses from the 14 independent colleges is now provided.

Percent of students admitted from private high schools. The percent of students admitted from private high schools ranged from 4 percent (Goodwin College) to 49 percent (Fairfield University), with an average of 28 percent.

Percent of accepted students who are transferring from community colleges. There is a wide range in the percent of accepted students who are transfers from community colleges, ranging from one percent or less (Connecticut College, Fairfield University, Trinity College, Wesleyan University, Yale University) to 40 percent of more (Albertus Magnus, Goodwin College, St. Joseph College, University of Bridgeport).

Remedial coursework. The colleges were asked what percent of their students took at least one remedial course. Of the 10 colleges who responded to this question, six said they did not offer remedial courses, while two of the colleges reported as many as approximately half of their students took at least one remedial course.

The percent of students taking a math remedial course ranged from six percent to 35 percent, and the percent taking an English remedial course ranged from 12 percent to 34 percent.

Campus career advising efforts. A multitude of activities were described by the independent colleges and universities. The following are some of the career advising efforts offered:

- Meet one-on-one or in groups with students to develop/explore career goals
- Use of standardized assessment instruments/career interest inventories to help guide career decisions
- Available career information/career library
- Resume and letter writing assistance
- Job search methods, interviewing skills
- Online access to current employment and internship postings
- Internship, co-op programs
- Pre-professional counseling for potential medical, dental, law students
- Assistance with graduate and professional school applications
- Interviewing techniques
- Career-related seminars and workshops, guest panelists (including alumni)
- Job fairs/on-campus recruitment, and accessing CTDOL College2Career Fairs
- Career advising through academic departments and individual faculty

Collaborations with public colleges and universities. While at least five of the 14 respondents reported no collaboration with any of Connecticut's public colleges or universities, a number of survey respondents mentioned active articulation agreements with local community colleges in the fields of engineering, nursing, criminal justice, social work, business and general degree completion.

Additionally, there is a Hartford Consortium for Higher Education, an independent and public university collaboration, that allows students to cross-register among its public institution members (UConn, CCSU, Capital) and independent institution members (Trinity College, University of Hartford, St. Joseph College, and Hartford Seminary).

Also mentioned was membership in the Connecticut Cooperative Education and Internship Association, a group of career services professionals from both two and four-year colleges and universities with active experiential learning programs.

Connecticut Department of Higher Education/ Board of Governors. Few suggestions were made regarding ways the Connecticut Department of Higher Education (DHE) could be more effective or helpful to the independent colleges and universities. One respondent suggested that DHE could provide more support and guidance for *developing articulation agreements with local community colleges*, including developing a handbook or other guide about how to develop such agreements.

When specifically asked about the Board of Governors of Higher Education process for approving new programs or degrees, many reported that the process added on three to six months once the application was submitted. It is a two-part process: first licensure (to begin the program) and then accreditation (to award degrees). A degree cannot be awarded unless the program is accredited by the state.

The delay in implementing a new program due to this approval process presents a challenge to colleges operating in an entrepreneurial mode, trying to get new programs marketed an running very quickly in order to meet the needs of the marketplace and community.

Several of the respondents further pointed out that the Board of Governors does not meet in July and August, slowing the process down even further. The need to market new programs prior to enrolling students, further delays the offering of new programs.

The national colleges (Connecticut College, Trinity College, Wesleyan University, Yale University) are not required to participate in this approval process. Several respondents pointed out that in most states, the state does not approve individual programs, and this precedent should be expanded to include all of the private colleges in Connecticut. One respondent noted that independent institutions should have autonomy in developing new programs, subject to oversight by the regional accrediting agency. The current process impedes the responsiveness of the independent institutions to emerging needs.

Beyond eliminating the requirement for independent colleges to participate in the program and degree approval process, another suggestion was to consider developing 'fast-tracks' for program development in areas of workforce shortage. For example, the Board of Governors could specify that, given a particular workforce shortage, the college proposing a new program to meet that need would have a shorter application the would require the college to show adequate resources (faculty, library, financial), and have developed a curriculum to be licensed to offer a program in the shortage area.

Yet another suggestion was that once a college is accredited (e.g., by the NEAS&C), it may not be necessary for the Board of Governors to approve every new degree program. However, what is necessary is a report to the Board of Governors so that programs conform to their records.

Lastly, concern was expressed that recent retirements had reduced the professional staff supporting program review processes from three to one—anticipating a possible further slow down in the approval process.

New program additions. Responses to how many new programs were typically added in one year, ranged from none to five new programs. One college noted that the last time a new program was added was in the early 1960s. About half responded that the college had added none or one new program. Table 1 shows the new programs noted at each of the colleges that responded to the CCIC survey—some mentioned programs added within the past three to five years, while others just mentioned programs added in the past year.

Table 1. Programs Recently Added to the Independent Colleges and Universities	
College/University	**New Programs**
Albertus Magnus	• MS in Education
Connecticut College	• Computer Science (2002) • Film Studies (2002)
Fairfield University	• BS in Biochemistry • MFA in Creative Writing • MA in Communications
Goodwin College	• Associate degree in Environmental Science • Associate Degree in Criminal Justice • Associate Degree in General Studies • Certificate in Brownfield Remediation • Certificate in Riverine Ecology • Certificate in Water Distribute Operations • Certificate in Water Treatment Operations • Certificate in Environmental Health Technician • BS in Child Studies • BS in Health Science • RN-BSN
Mitchell College	• Early Childhood Education • Business • Hospitality and Tourism • Global Studies • Sport Management • Homeland Security • Communications
Rensselaer	None
Sacred Heart University	• MA in Criminal Justice • BS in Marketing (2009) • MS in Exercise Science and Nutrition (2009) • ESL Programs (2009)
St. Joseph College	• Online Masters in Biochemistry • Online Masters In Nutrition • Bachelor's in Women's Studies • Graduate Certificate in Latino Community Practice
Trinity College	• Environmental Science

Table 1, Continued. Programs Recently Added to the Independent Colleges and Universities	
College/University	**New Programs**
University of Bridgeport	• Online MS in Computer Science • Online MS in Technology Management • MS in Instructional Technology • Ph.D. in Computer Science and Engineering • Certificate in Human Resource Management • Online B.S. in Dental Hygiene • M.S. in Dental Hygiene • Online M.S. in Dental Hygiene • Online B.S. in General Studies • B.A. in Martial Arts Studies • M.A. in Global Development and Peace • B.A. in Criminal Justice and Human Security(pending) • B.S. in Health Sciences (pending) • B.S. in Medical Technology (pending) • M.S. in Physician Assistant (pending)
University of Hartford	• Masters in Aural Habilitation • Masters in Prosthetics and Orthotics • Bachelor's in Secondary Education in Mathematics • Master of Fine Arts in Illustration
Wesleyan University	None
University of New Haven	• M.S. in Network Systems • B.A. in Theatre • M.S. in Labor Relations in Waterbury, CT
Yale University	• Computing and the Arts (2008) • Modern Middle East Studies (2008) • Added BS program to BA program in Psychology • South Asian Studies
Source: July 2009, the Connecticut Conference of Independent Colleges (CCIC) survey.	

Discontinued programs. Responses to how many programs are dropped per year often elicited a response of "rarely" or "none." Discontinued programs are shown in Table 2.

Percent of registered nurses placed within six months of graduation. Survey respondents with nursing programs at their colleges or universities reported anywhere from 65 percent to 100 percent employed within six months of graduation.

Percent of engineers placed within six months of graduation. Survey respondents with engineering programs at their colleges or universities reported a range from 60 percent to 100 percent employed within six months of graduation. One university commented that graduates continued in positions held while an engineering student and others went directly to graduate school.

Table 2. Programs Recently Discontinued by the Independent Colleges and Universities	
College/University	**Discontinued Programs**
Albertus Magnus	• Rarely
Connecticut College	• Typically none • Masters in Music • Masters in Biology • Masters in Botany • Masters in Chemistry
Fairfield University	• None dropped within the past year
Goodwin College	• Associate in Computer Systems Technology
Mitchell College	• None
Rensselaer	• None
Sacred Heart University	• Certificate in Spirituality • B.S. in Environmental Science • Bachelor's in Information Technology in Luxembourg
St. Joseph College	• Bachelor's in Environmental Science • Bachelor's in Sociology • Bachelor's in Economics
Trinity College	• None
University of Bridgeport	• None since 2000
University of Hartford	• Master's in Counseling • 6th Year Certificate Program in School Administration
Wesleyan University	• None recently • Last discontinued program was the Master of Arts in Teaching (1971)
University of New Haven	• Several Certificate programs (not specified)
Yale University	• Renaissance Studies
Source: July 2009, the Connecticut Conference of Independent Colleges (CCIC) survey.	

Percent of graduates who remain in Connecticut to work. The percent of graduates who remain in Connecticut to work was estimated to range from seven percent (Yale University) to ninety percent (Albertus Magnus College). As one would expect, the national universities had lower percentages, while the regional colleges had higher percentages.

Ways Connecticut Department of Labor workforce shortage projections are used. While a few respondents said they did not use the Connecticut Department of Labor workforce shortage projections, many of the independent colleges and universities reported using the information in their planning process and determining which new programs are feasible to consider offering. Others mentioned using the information in preparing their application for new program approval by the Board of Governors.

Some specific examples given included use of the projections to grow their School of Nursing, including expansion of accelerated second degree program for adult learners to enter the nursing profession; initiation of an articulation agreement between the community colleges and the

School of Engineering; and expansion of special education and bilingual/TESOL education programs.

Some respondents also noted that their career centers used and distributed "Connecticut Career Paths" for student exploration purposes. College career services also provide such information to professionals and academic advisors, and to students and alumni as an aide to planning their academic programs and subsequent careers.

Other comments. The following are some of the additional comments provided by CCIC survey respondents.

"As a private institution, we take great care to align our program development efforts with real student needs. As a liberal arts college, we are also sensitive to the role of a general education in developing thoughtful and competent citizens."

"Although about 75% of our students enter the workforce immediately after graduation, as a liberal arts college, we are not primarily concerned with educating students to commence particular careers immediately upon graduation…"

The university's "…education is about more than employment at the completion of four years. Rather, it is the development of the person, the mind, and the heart. Career development is a part of that process but it is not a means to an end…"

"Studies and trends indicate that career offices need to assume a place at the strategic and academic decision-making levels as colleges adjust to meet 21st century challenges in a complex, global world…"

"Curricula that require internships for college graduation are becoming the norm in most disciplines which are employment specific…"

(would be helpful to have) "…a program to encourage nurses to get graduate degrees so that we might have more nurse educators…"

"In tough times, there has been movement to support and fund workforce retraining—some or much of which has been oriented to two-year colleges…On the other hand, dramatic changes in the global economy require cultivation of high-level skills to confer competitive advantages on University graduates. Thus we encourage greater funding for education at the 4-year and graduate-levels."

"It is our experience that in Connecticut, the task of economic development is especially challenging because the region's strength—its diversity of communities and reputation for municipal autonomy—does not equip it well for planning its future in global economy. We lack a strong regional identity as well as the institutions (e.g., county government or a "Research Triangle" type of brand) that facilitate planning and cooperation among towns and stakeholders…"

Appendix H. Green Certificates and Degrees Offered at each of the Connecticut Community Colleges														
Program	**Credit/ Noncredit**	**Degree Certificate**	**ACC**	**CC C**	**GWC C**	**HC C**	**MCC**	**MXCC**	**NVCC**	**NWCC**	**NC C**	**QVCC**	**TRCC**	**TXCC**
Alternative Fuel Vehicles	credit	certificate			x									
Automotive Technology	credit	degree			x				x					
Automotive Technician	credit	certificate			x									
Architectural Technology	credit	degree		x							x		x	
Construction Technology	credit	degree or cert									x	x	x	
Sustainable Building Efficiency / Facilities Management	credit	certificate									x		x	
BPI Certificate	noncredit	certificate				x			x					
Building Analyst Training	noncredit	certificate									x			
Connecticut Lead Supervisor Initial Training	noncredit	certificate									x			
Envelope Professional Training	noncredit	certificate									x			
Go Green Certificate Program	noncredit	certificate						x						
Green Building Boot Camp	noncredit	certificate		x										
Hazwoper Initial Training	noncredit										x			
Intro. to Green Building	noncredit			x										
LEED Certificate	noncredit	certificate		x										
Sustainable Building / Advisor Certificate	noncredit	certificate			x	x								
Weatherization Training I and II	noncredit	certificate		x		x					x			
Certificate in Sustainable Energy	credit	certificate					x							
CL & P Residential Home Energy Audit	noncredit	certificate							x					
Solar Installer Certificate	noncredit	certificate			x									
Envir - Pre-Environmental Liberal Arts and Sciences	credit	degree				x								
Environmental Engineering Technology	credit	degree											x	
Environmental Science / Toxicology / Biotechnology	credit	degree			x		x	x	x				x	
Landscape and Horticulture	credit	degree							x					
Technology Studies: Environmental Science: Natural Resources Option	credit	degree								x				
Landscape-Sustainable - Ecology & Conservation Technician	credit	certificate											x	
Water - Clean Water / Water Treatment	credit / nc	certificate			x				x					
Hazardous Materials Operational / Waste Site Worker	noncredit	certificate						x						

Appendix H. Green Certificates and Degrees Offered at each of the Connecticut Community Colleges														
Program	**Credit/ Noncredit**	**Degree Certificate**	**ACC**	**CCC**	**GWCC**	**HCC**	**MCC**	**MXCC**	**NVCC**	**NWCC**	**NCC**	**QVCC**	**TRCC**	**TXCC**
Recycling Auditing Certificate	noncredit	certificate							x					
Lean Manufacturing	credit	certificate										x		
Manufacturing Electronics	credit	degree	x											
Manufacturing Engineering Science	credit	degree					x							
Manufacturing Engineering Technology	credit	degree			x								x	
Manufacturing Technology	credit	degree						x						
Manufacturing Technology Certificate	credit	certificate						x						
Technology Studies: Machine Tech Option	credit	degree	x											
Green Welding	noncredit								x					
Alternative Energy Systems Technology	credit	certificate							x					
Alternative Fuel Cell Technology	credit	degree							x					
Biotechnology	credit	degree						x						
COT: Technology Studies	credit	degree	x	x	x	x	x	x	x	x	x	x	x	x
Electrical Engineering Technology	credit	degree			x				x					
Electronics Technician	credit	certificate			x									
Source: Assistant Chancellor of Connecticut Community College System.														

Appendix I. Credit and Noncredit "Green" Courses Available at Connecticut Community Colleges

Term	Credit Course Title	ACC	CCC	GWCC	HCC	MCC	MXCC	NVCC	NWCC	NCC	QVCC	TRCC	TXCC	TOTALS
Fall 2007	Environmental Regulations	-	-	15	-	-	-	-	-	-	-	-	-	15
Fall 2007	Environmental Studies	-	-	-	-	-	-	-	-	-	-	31	-	31
Fall 2007	Environmental Systems	-	12	-	-	-	-	-	-	26	-	-	-	38
Fall 2007	GREENHOUSE MANAGEMENT II	-	-	-	-	-	-	8	-	-	-	-	-	8
Fall 2007	General Ecology with Lab	-	-	-	-	-	-	-	26	-	-	-	-	26
Fall 2007	Intro to Environmental Sci	-	-	-	-	82	46	-	54	-	-	-	-	182
Fall 2007	Intro to Environmental Science	-	-	-	-	-	-	-	-	-	30	-	-	30
Fall 2007	LAB, Water Resources Engr	-	-	-	-	-	-	-	-	-	-	8	-	8
Fall 2007	Principles of Ecology	11	-	-	-	-	-	-	-	-	-	-	-	11
Fall 2007	Water Resources Engineering	-	-	-	-	-	-	-	-	-	-	8	-	8
Spring 2008	ENVIRONMENTAL SCIENCE	-	-	-	-	-	-	24	-	-	-	-	-	24
Spring 2008	Environmental Issues Seminar	-	-	-	-	-	-	-	-	-	-	16	-	16
Spring 2008	Environmental Systems	-	-	-	-	-	-	-	-	22	-	-	-	22
Spring 2008	GREENHOUSE MANAGEMENT I	-	-	-	-	-	-	19	-	-	-	-	-	19
Spring 2008	Intro to Environmental Science	-	-	-	-	138	43	-	47	-	39	-	-	267
Spring 2008	Principles of Ecology	31	-	-	-	-	-	-	-	-	-	-	-	31
Spring 2008	ST: Environmental Science	-	-	-	-	-	-	-	-	-	-	-	12	12
Summer 08	General Ecology with Lab	-	-	-	-	-	-	-	12	-	-	-	-	12
Summer 08	Intro to Environmental Science	-	-	-	-	-	-	-	17	-	-	-	-	17

Appendix I Contd. Credit and Noncredit "Green" Courses Available at Connecticut Community Colleges

Term	Credit Course Title	ACC	CCC	GWCC	HCC	MCC	MXCC	NVCC	NWCC	NCC	QVCC	TRCC	TXCC	TOTALS
Fall 2008	Environmental Regulations	-	-	12	-	-	-	-	-	-	-	-	-	12
Fall 2008	Environmental Studies	-	-	-	-	-	-	-	-	-	-	55	-	55
Fall 2008	Environmental Systems	-	11	-	-	-	-	-	-	24	-	-	-	35
Fall 2008	GREENHOUSE MANAGEMENT II	-	-	-	-	-	-	11	-	-	-	-	-	11
Fall 2008	General Ecology with Lab	-	-	-	-	-	-	-	20	-	-	-	-	20
Fall 2008	Intro to Environmental Science	-	-	-	-	137	51	-	62	-	28	-	-	278
Fall 2008	LAB, Water Resources Engr	-	-	-	-	-	-	-	-	-	-	13	-	13
Fall 2008	Principles of Ecology	24	-	-	-	-	-	-	-	-	-	-	-	24
Fall 2008	Sustainable Energy & the Env	-	-	-	-	28	-	-	-	-	-	-	-	28
Fall 2008	Water Resources Engineering	-	-	-	-	-	-	-	-	-	-	13	-	13

Term	Credit Course Title	ACC	CCC	GWCC	HCC	MCC	MXCC	NVCC	NWCC	NCC	QVCC	TRCC	TXCC	TOTALS
Spring 2009	ENVIRONMENTAL REGULATIONS	-	-	-	-	-	-	24	-	-	-	-	-	24
Spring 2009	ENVIRONMENTAL SCIENCE	-	-	-	-	-	-	25	-	-	-	-	-	25
Spring 2009	Environmental Issues Seminar	-	-	-	-	-	-	-	-	-	-	21	-	21
Spring 2009	Environmental Law	-	-	-	-	23	-	-	-	-	-	-	-	23
Spring 2009	Environmental Systems	-	-	-	-	-	-	-	-	26	-	-	-	26
Spring 2009	GREENHOUSE MANAGEMENT I	-	-	-	-	-	-	20	-	-	-	-	-	20
Spring 2009	Intro to Environmental Science	-	-	-	-	137	50	-	59	-	48	-	-	294
Spring 2009	Introd. to Environ. Science	-	-	27	-	-	-	-	-	-	-	-	-	27
Spring 2009	Principles of Ecology	8	-	-	-	-	-	-	-	-	-	-	-	8

Appendix I Contd. Credit and Noncredit "Green" Courses Available at Connecticut Community Colleges

Term	Credit Course Title	ACC	CCC	GWCC	HCC	MCC	MXCC	NVCC	NWCC	NCC	QVCC	TRCC	TXCC	TOTALS
Spring 2009	Sustainable Energy & the Env	-	-	-	-	27	-	-	-	-	-	-	-	27
Summer 09	General Ecology with lab	-	-	-	-	-	-	-	10	-	-	-	-	10
Summer 09	Intro to Environmental Science	-	-	-	-	-	-	-	13	-	-	-	-	13
Fall 2009	Environmental Regulations	-	-	22	-	-	-	-	-	-	-	-	-	22
Fall 2009	Environmental Studies	-	-	-	-	-	-	-	-	-	-	74	-	74
Fall 2009	Environmental Systems	-	12	-	-	-	-	-	-	24	-	-	-	36
Fall 2009	GREENHOUSE MANAGEMENT II	-	-	-	-	-	-	11	-	-	-	-	-	11
Fall 2009	General Ecology with Lab	-	-	-	-	-	-	-	21	-	-	-	-	21
Fall 2009	Intro to Environmental Science	-	-	-	-	195	68	-	65	-	71	-	-	399
Fall 2009	Introd. to Environ. Science	-	-	48	-	-	-	-	-	-	-	-	-	48
Fall 2009	LAB, Water Resources Engr	-	-	-	-	-	-	-	-	-	-	14	-	14
Fall 2009	Principles of Ecology	17	-	-	-	-	-	-	-	-	-	-	-	17
Fall 2009	Sustainable Energy & the Env	-	-	-	-	27	-	-	-	-	-	-	-	27
Fall 2009	Water Resources Engineering	-	-	-	-	-	-	-	-	-	-	16	-	16
	TOTALS:	**91**	**35**	**124**	**-**	**794**	**258**	**142**	**406**	**122**	**216**	**269**	**12**	**2,469**

Term	Noncredit Course Title	ACC	CCC	GWCC	HCC	MCC	MXCC	NVCC	NWCC	NCC	QVCC	TRCC	TXCC	TOTALS
Summer 2007	GREEN BLDG HOME IMPROVEMENT	-	-	-	-	-	-	5	-	-	-	-	-	5
Fall 2007	R/E ENVIRONMENTAL ISSUES	-	-	-	-	-	-	-	-	36	-	-	-	36
Fall 2007	GREEN REVOLUTION OVERVIEW	-	-	-	-	-	-	9	-	-	-	-	-	9

Appendix I Contd. Credit and Noncredit "Green" Courses Available at Connecticut Community Colleges

Term	Credit Course Title	ACC	CCC	GWCC	HCC	MCC	MXCC	NVCC	NWCC	NCC	QVCC	TRCC	TXCC	TOTALS
Fall 2007	Environmental Interests (LiR)	-	-	-	-	-	-	-	-	-	47	-	-	47
Spring 2008	Greenhouse Basics	-	-	-	-	-	-	-	6	-	-	-	-	6
Spring 2008	R/E ENVIRONMENTAL ISSUES	-	-	-	-	-	-	-	-	47	-	-	-	47
Spring 2008	Solar App. For Your Home/Bus.	-	-	6	-	-	-	-	-	-	-	-	-	6
Spring 2008	Solar/Thermal Energy-Intro	-	-	28	-	-	-	-	-	-	-	-	-	28
Spring 2008	Environmental Seminar	-	-	-	-	-	-	-	-	-	-	10	-	10
Fall 2008	Trash/Going Green	-	-	-	-	-	38	-	-	-	-	-	-	38
Fall 2008	Solar App Your Home/Business	-	-	15	-	-	-	-	-	-	-	-	-	15
Fall 2008	Solar/Thermal Energy-Intro	-	-	16	-	-	-	-	-	-	-	-	-	16
Fall 2008	Sustainable Bdg Advisor Cert	-	-	19	-	-	-	-	-	-	-	-	-	19
Spring 2009	Greenhouse Basics	-	-	-	-	-	-	-	6	-	-	-	-	6
Spring 2009	Solar Application for Home/Bus	-	-	7	-	-	-	-	-	-	-	-	-	7
Spring 2009	Sustainable Business Develop	-	-	7	-	-	-	-	-	-	-	-	-	7
Spring 2009	Will Solar Electric & Thermal	-	-	7	-	-	-	-	-	-	-	-	-	7
	TOTALS:	**-**	**-**	**105**	**-**	**-**	**38**	**14**	**12**	**83**	**47**	**10**	**-**	**309**

Source: Assistant Chancellor of Connecticut Community Colleges.

Appendix J
Connecticut Community College System Provision of Child Care Services

Asnuntuck CC - Children's Reading Room Capacity: Wait List: No. Children Age Range: 3 years and older	Open for Summer Semester? No Operating Days: Monday-Thursday Operating Hours: 8:30 AM – 3:30 PM Cost: Free to Students/Faculty & Staff
Capital CC – Elaine Steward McKirdy Laboratory School at Capital Community College Capacity: 22 Wait List: Y/N Yes. If yes, how many? 8 Children Age Range: 3 years and 4 year olds	Not open for Summer Semester only academic semesters. Operating Days: Operating Hours: Cost: Student's child fee: $2.50 per hour Faculty member's fee: $3.50 per hour Public fee: $4.00 per hour
Gateway CC – The Early Learning Center Capacity: Wait List: Yes If yes, how many? 50 Children Age Range: 3-5 (pre-K)	Open for Summer Semester? Yes. Have a separate summer camp program for children enrolled during school year. Operating Days: M-F Operating Hours: 7:30 AM – 5:30 PM Cost: Student's child fee: $115 Full-time; $60 M,W,F; or $60 T, R Community: $165 Full-time care; $115 M,W,F; or $85 T, R
Housatonic CC – Early Childhood Laboratory School Capacity: 47 Wait List: Yes If yes, how many? 78 Children Age Range: Pre-school aged, 3 & 4 year olds	Open for Summer Semester? Yes. One room, 24 slots. Operating Days: M-F Operating Hours: 7:30 AM – 5:30 PM Cost for Students: Sliding scale based on income and number in family for Bridgeport residents who are part of the Bridgeport School Readiness Child Care Grant. Community: $5.00 per hour
Manchester CC – Child Development Center Capacity: 24 Wait List: No Children Age Range: 3 – 5 year olds. Children 2.9 in September are eligible.	Not open for Summer Semester. Operating Days: M-F Operating Hours: M-R (9AM – 4 PM; F: 9AM – 12 PM Cost - Students: $21 per day/$10.50 per half day Staff/Faculty: $27 per day; $13.50 per half day Community: $31 per day; $15.50 per half day
Middlesex CC – Middlesex Community College Childcare and MxCC Preschool Center Capacity: 24 Wait List: Yes. If yes, how many? 6 at both locations Children Age Range: 2 years 10 months – five years old.	Campus site is open for summer semester; Operating Days: Monday - Friday MxCC Preschool Operating Hours: M,T, W, R: 7:45 AM – 3:45 PM; F: 7:45 AM – 1:45 PM Cost: Non-readiness families at campus site are $20 for AM & $15 for PM. MxCC Preschool at Macdonough School Operating Hours: M- F 8 AM – 3:45 PM Cost: Sliding scale Not open for summer semester. Students/Public fee is $6,000 year.

Appendix J
Connecticut Community College System Provision of Child Care Services

Naugatuck Valley CC – Naugatuck Valley Child Development Center The Discovery School is collaboration between NVCC and the Waterbury Public School Pre-K Program. Capacity: 48 Wait List: Yes. If yes, how many? 129 15 of these children are waiting for school readiness). Children Age Range: 1 toddler program for 8 children; 1 pre-school class of 20 children	The School Readiness Grant Program is open for Summer Semester. The Discovery School is open year round. Operating Days: NVCDC – Mondays – Fridays Operating Hours: M-R 8 – 4 PM ; F: 8 - Noon Cost: Students/Faculty/Community $24.00 per day Operating Days: School Readiness/Discover School—Mondays – Fridays Operating Hours: 7:30 AM – 5:30 PM for Waterbury residents. Fees determined on a sliding scale. Max. per week is $135. For the second preschool the cost is $12 per half day; $24 per full day until 4 PM; The toddler program cost is $14 per half day, or $28 per full day until 4 PM. The second preschool classroom and the toddler classroom are open Monday-Thursday from 7:30 – 4 PM and Fridays from 7:30 – Noon and are open with the college calendar.
Northwestern CC – NCCC ECE Lab School/Child Development Center Capacity: 20 Wait List: Yes. 2 2 – 5 year olds.	Not Open for Summer Semester. Operating Days: M – F Operating Hours: 7:45 AM – 5 PM Full & Half day fees for Community, Staff, & Students
Norwalk CC –Kathryn Croaning Child Development Laboratory School Capacity: 44 Wait List: Yes. 75 on waiting list (51 on the list are infant/toddlers 6months – 3 years old). Age range: 6 months – 5 years	Not open for Summer Semester. Operating Days: Monday – Friday Operating Hours: 8 AM – 3 (M – R); 8AM – Noon (F) School Readiness (3 – 5 year olds) M-F 8 AM – 3 PM Cost: $6 per hour minimum of 14 hours per week (Tuesday & Thursday); maximum of 32 hours (M-F) $8/hour for Faculty $10/hour for public
Quinebaug Valley CC – Steppingstones Early Learning Center Capacity: 32 Wait List? Yes. 20	Open for Summer Semester? Yes. Operating Days – Monday - Friday Operating Hours: 7:30 – 5:30 PM Sliding Scale: No Cost: Student's Child , Faculty , Staff & Community: $12 half day/$24 full day
Three Rivers CC – The Child Development Center at Three Rivers Community College Capacity: 38 No Waiting List at this time. Age Range will serve infants through preschool age children.	To be opened on campus Spring 2010. The Center will be open year round. Operating Days: Monday – Friday Operating Hours: 7:30 am – 5:30 pm. The fees will be determined by the vendor.

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Tunxis CC – The Early Childhood Center Lab School Capacity: 37 Wait List: No waiting list at this time. Age Range: 3 to 5 year olds	Open September through June (not open in the summer). Days of Operation – Monday through Fridays Hours of Operation: M-R 8 AM – 4 PM & F: 8 AM – 1 PM Cost: Students pay $3 per hour Staff/Community pay $6.50 hour
Source: Connecticut Community College System, November 2009.	